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AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

JANUARY 1980

For Pilots Only

SEE PAGE TWO

Low Altitude Operations

Below is a letter from Brig Gen Thomas S. Swalm to members of the 57th TTW at Nellis AFB, NV. We pass it on because we think he has said some important things about a very sensitive subject. Our thanks to General Swalm for permission to use it here.

■ "1. I am convinced we are not being realistic in our realistic training. It is a real combat training breakthrough to be allowed to routinely, at pilot discretion, operate below 500′ AGL and, in some cases, even down to 100′ AGL. However, we seem to have interpreted this authorization to be a requirement to stay low throughout all missions, even when not required by proximity of air or ground threats. This is unrealistic.

"2. Low altitude operations, demanding the highest level of pilot skill and proficiency, will be required regularly under wartime conditions, but not every mission nor throughout any given mission. Low altitude operations place pilots and aircraft in a regime where there is virtually no safety margin available. The pilot has only a fleeting second or two to react to a misjudgment, miscalculation, or malfunction before he is past the point of recovery. He is regularly at the edge of the safe ejection envelope. There is no reason to operate this close to the margin of safe operation unless required. We have assumed the enemy radar, SAM, and air-to-air threats to be nearly perfect in their ability to detect us and to then bring us down. This is not true. They are not perfect. Their omnipotence is somewhat exaggerated. We have let perceived enemy capabilities force us to routinely operate in a regime where we do as much damage to ourselves as the enemy can, and most of our self-inflicted losses will be unnecessary.

"3. There is a way of significantly reducing our self-inflicted low altitude losses. We should subject ourselves to the dangers and rigors of low altitude operations only as required to safely penetrate high threat areas or to negate ground-based or airborne reactions against us. A key element in knowing when to get low and when you can operate at higher altitudes, where more reaction time is available to respond to mistakes and aircraft problems and have a safe ejection guaranteed, is to thoroughly know enemy detection capabilities, the effective range and capabilities of ground-based anti-air weapons, and the range and capabilities of enemy threat aircraft.

"4. Not every enemy radar operator, AAA/SAM gunner, or pilot is an automatic ACE. Enemy equipment has limitations. They all can be rendered ineffective or defeated by smart pilots who know their capabilities and deficiencies. Operating below 500′ AGL may not be necessary if you are smart. Operating below 500′ AGL on all missions, in all areas, all of the time may be an unnecessary risk you are taking. I request all aircrews review their perception of the requirement to stay low all of the time. Analyze enemy capabilities as we have simulated on our ranges and see where you are taking unnecessary risks." ■

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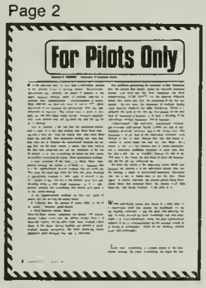
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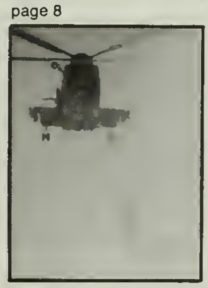

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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For Pilots Only

ROGER G. CREWSE · Directorate of Aerospace Safety

■ In the past two years we have seen a substantial change in our overall Class A mishap profile. Historically, operational type mishaps ran about 47 percent of our totals, logistics mishaps about 42 percent, and the remainder were undetermined or environmental in nature. Now, and this has been true since the end of 1977, about two-thirds of our mishaps are operational, while less than one-third are logistics. The overall rates in terms of mishaps per 100,000 hours really haven't changed substantially, even though they are up from the mid-70s by 10- to 15 percent.

Also of concern is the fact that the destroyed aircraft rate is high, as is the fatal mishap rate. Now these aren't up just a little bit – they are higher than they have been since the late 60s. The destroyed aircraft and fatal mishap rates are up because the operational mishaps are up, and they are far more serious in nature than they used to be. We have agonized over the rate increases for the last 18 months or so, told everything we know and then some, in an effort to reverse the trends in the operational mishaps.

A brief summary of the facts is in order. When operational mishaps are looked at in detail, it is apparent that it is the fighter/attack aircraft mishaps that are really up. This does not mean that there has been any great decrease in operational mishaps in other types of aircraft at all. As a matter of fact, the rest of the aircraft types have kept clicking along at their usual frequency, as far as operational mishaps are concerned, and should give none of us any warm feelings.

In the fighter/attack mishaps we find two types of losses that are driving all rising trends:

- Collision with the ground or water with, as far as we know, a perfectly good aircraft.
- Pilot-induced control losses.

Both of these mishap categories are deadly. We destroy aircraft almost every time and almost always there is at least one fatality. On the other hand. those mishaps which occur on the range, during landing and takeoff or point-to-point normal navigation, and those involving midair collisions have changed very little in frequency.

The problems generating the increases in both collisio with the ground and control losses are basically missic related. Low level nav, low level formation, low le maneuvering, ACM, DACT, are the mission eleme where they occur and, with the exception of the last t months, for two years the frequency of mishaps duri these mission elements has been increasing. While it certainly too early to tell, the last two months of the y may be signaling a decrease or at least a leveling of operational mishap frequency. We're hopeful.

Unfortunately, and naturally, operational misha get everyone tight-jawed. Rarely is there any type of m function involved; however, this is not always true. C tendency is to get mad at the individual involved, e though he may be dead. Mostly they look like dumb cidents by dumb pilots and that isn't true either. A matter of fact, it is our opinion that we could court-m tial or otherwise unburden ourselves of every pilot v has had a bash and we wouldn't change the rate at The facts of the matter are that most of them die anyh and yet the rate has continued on.

To limit our action to the individual event which p cipitates the mishap or to the individual himself who the mishap, is really an ostrich-like maneuver. We kn who did it and we know what he did, but why? O again, we believe that since the system selects these fo trains them, and commits them, the system itself t must be a part of the problem, if not most of it.

When underlying causes that result in a pilot erro a supervisory error type mishap are examined, we the leading contender is that the pilot was pressing hard or *being* pressed too hard. Combined with that of times is an overcommitment. Either the pilot overcom himself or he is overcommitted by the mission which is trying to accomplish, based on his training, kno edge, and proficiency.

Low event proficiency is a large player in the o ational mishap. By event proficiency we mean the

ery now and then an article appears at stands out . . . one that strikes home and says what eds to be said clearly and concisely. We believe this ticle falls into that special category and commend it as important reading.

ency the pilot had for the specific event he was trying ccomplish at the time of the mishap. We have few ts who don't get enough 30-60-90-day time, and I am there are few whose training squares aren't filled. in 48 percent of the mishaps we have looked at, the t or the crew involved had either never done the spe- event before, had not done it for at least two months r to the mishap, or had done it once before, recently, only for the first time.

almost half of the collisions-with-the-ground mis- involving fighter or attack aircraft, event proficiency a factor. The first time that low, first time in that nation position, first time on that range, first time on exercise with those specific parameters—all of those been factors in our collision-with-the-ground mis- .

riefings. Here we aren't talking about the fact that pilot wasn't briefed to put in left rudder when the air- drifted right on the runway. We assume he learned someplace in his career and doesn't need to be briefed t. But if the mission elements are not covered in the fing, or if while the aircraft are still in the chocks use of early abort, the mission is changed and there briefing, then there is a good possibility of commit- some folks for a mission for which they have not been fed. Secondary missions—instruments, navigation, ever—oftentimes are briefed just about in that de- and that bites us with one of those dumb accidents.

kill and technique deficits primarily concern the con- loss and landing and takeoff mishaps. They also are rs in mishaps where there is an overcommitment. inter, for instance, we become extremely optimistic t the weather, particularly runway visibility and ngs, when we attempt to bring our machines home r than scatter them at other bases. Destination fixa- on the part of the crews, as well as supervisory per- el, lead us into situations where marginal weather mes sub-marginal and cannot be coped with regard- less of skill levels or techniques used by the pilot. Then we have another one of those dumb accidents.

Experience levels. We find in some of our mishaps that experience, both UE and total time, is a definite factor. We see where a pilot may have had a considerable amount of total time but no mission experience that parallels his current assignment. If his UE time is low then, we have the probabilities of a mishap soaring. From what we see in our accident pilot experience, both total and UE time, experience is a significant factor in the control loss and range mishaps, while in the other types of mishaps, excluding the solo UPT pilot in the training command, it is not.

Distraction/inattention. Distraction and inattention, task saturation, loss of situational awareness, or whatever you want to call it, is the single problem that precipitates collision-with-the-ground mishaps. Out of the 40 plus we have had in the last two years, where a perfectly good airplane, as far as we know, was flown into the ground, none of the aircrews involved knew they were going to do that until just before they did, if at all. The mistake? Attention, for whatever reason, was subtracted from flying the aircraft, to the point that the pilot was unaware that he was about to hit the ground.

The reasons for the distractions are not really as dumb as the accident seems to be on the surface. The conditions which distract from flying the aircraft in the low level environment are very predictable. Low level nav over flat or undulating terrain in a spread formation requires considerable attention outside the cockpit. First time for a crew in a formation position that low, combined with first time on the range or in an exercise, can make a collision-with-the-ground mishap distinctly possible. At the best, that combination may result in the fact that you had

continued on page 18

Pop goes the life raft!

PAT HENRY/Chief Experimental Test Pilot
and **FRANK MANIE**/Senior Engineer, Design, McDonnell Aircraft Co.

It doesn't happen often but you had better be ready when . . .

■ During the course of a recent accident investigation, the potential results of an uncommanded in-cockpit life raft inflation were brought into sharp focus. While highly improbable, there is evidence that it does happen, and that it could contribute significantly to a hazardous incident or even accident. Since it would be an immediately alarming event for the pilot, to say the least, this article hopefully will help prepare him mentally for the quick reaction necessary to cope with this unpleasant potentiality.

The scenario we investigated, and are reporting on below, is that of a life raft suddenly trying to inflate with the pilot still strapped comfortably (up to that point) in his seat in the airplane. This huge canvas balloon that's trying to instantly mature underneath an unfortunate crewman can break the survival kit latches as it attempts to escape its confines. When this happens, it is guaranteed to cause personal discomfort of rapidly increasing severity, and more than likely some incapacitation, as you will see below.

The Investigation

The Life Support, Crew Station Engineering, System Safety, and Flight Operations groups here at MCAIR collaborated to investigate this situation, using an ACES II seat and a laboratory test setup. The object of the investigation was two-fold, thus requiring two consecutive tests. The first test was designed to establish the force, in terms of lapbelt load, that would be induced by life raft inflation; the second was to quantify the human tolerance level and reaction to those loads.

Test One—The Dummy

For the first tests we used a 5th percentile Alderson dummy seated in an ACES II ejection seat. All attaching hardware was standard USAF equipment except for the lapbelt, which was instrumented with strain gauges to measure tension. The survival kit was a production "fly-away" ACES II kit, fully packed, including the LRU-16/P life raft and the FLU-2A/P carbon dioxide cylinder. Both a pressure transducer and a direct reading gauge were installed in the inflation assembly to record life raft pressures. Initiation was via a static line attached to the CO2 bottle.

Upon actuation of the CO2 bottle, the life raft partially inflated within the survival kit container. Pressure within the life raft reached 45 psi almost instantaneously. The raft cammed the seat pan latch open and rotated the seat pan up approximately 2.0 inches along the rear edge, raising the dummy in the seat according
Lapbelt tension reached 450 pou
within 3.0 seconds and rose to 4
pounds within 50.0 seconds!

While these figures may not se
significant at first, consider that
45 psi measured in the raft increa
with altitude. Thus the lapbelt tens
of 475 pounds, equivalent to a do
ward load of 950 pounds across
mid-section, would also increa
with altitude, producing a tension
540 pounds, or a total load of 1(
pounds at a cockpit altitude of 14,(
feet!

Test Two—Live Subjects

Obviously, only a dummy wo
"sit still" for something like
highest numbers recorded in the f
tests. So our second series of t
were conducted on real live "vol
teers," who would add a subject
aspect to the investigation by be
able to say "OUCH, this is enoug
at the proper time. We proceeded
these second tests somewhat c
tiously, but anxious to see exa
what human reaction to loads of th
magnitudes would be.

This test setup was a little m
elaborate than our first one beca
of the safety precautions requi
The seat, attaching hardware,
survival kit were from the first t
but in place of the CO2 bottle,

ed a controlled nitrogen source with subject-held dump valve switch. is was necessary to command the lation value while maintaining the plicable rate of onset, while allow- the subject to terminate the test the event the forces became too eat.

The test subjects were subjected gradually increasing lapbelt loads, ch time deflating the raft and re- arging the nitrogen source to the xt higher value. The tests were con- ued until lapbelt tensions of slightly er 400 pounds (800 pounds total d) were reached. At this point we emed to be approaching the sub- t's willing tolerance level, with no ubt that the significance of the prob- n had been clearly demonstrated.

e Conclusions

After the tests were completed, analyzed the data and drew the lowing conclusions:

- While the test did not establish ultimate lapbelt tension physically erable by an aircrewman, it was nerally concurred that lapbelt ten- ns of about 400 pounds are ex- mely uncomfortable and would quire immediate corrective action.
- Within the limits of the tests formed, no involuntary reactions re noted; however, it can be reason- y assumed that the total surprise the inadvertent raft inflation would w a good portion of the aircrew's ention immediately, and would nter his attention on resolving that ecific situation.
- The maximum time that the lap- t load is tolerable appears to be un- edictable from these tests and pos- ly variable from subject to subject. is fair to conclude that a crewman uld make every possible effort to ieve the tension as soon as possible her than live with the condition til landing the aircraft.

The technical and quantitative ults of a life raft inflation as meas- ed in our simulations are obvious the numbers recorded. It is some- at more difficult to clearly convey qualitative and emotional results such a traumatic event.

All subjects, pilots and engineers alike, were unanimous in describing the rapidly mounting pain and alarm as the seat rose and attempted to squeeze one in half with his own lapbelt. Even though sitting there in the relative comfort and security of our Life Support Equipment Lab (at zero mach and floor level) we all experienced an apprehension which built almost instantly—probably because there was no discernible end point to the rapidly increasing pain. This concern and pain immediately commanded almost all of one's attention. It is easy to imagine how much more alarming it would be inflight due to the hostile environment and obvious potential consequences. There's no doubt in our minds that the pilot is going to stop doing almost everything, except flying into the trees, to address this new problem. It is a real attention getter.

None of us subjects were the least bit interested in subjecting ourselves to loads representative of what the dummy felt during the actual inflation test. When one realizes that those loads would be significantly higher again at elevated altitudes, the picture becomes even more sobering.

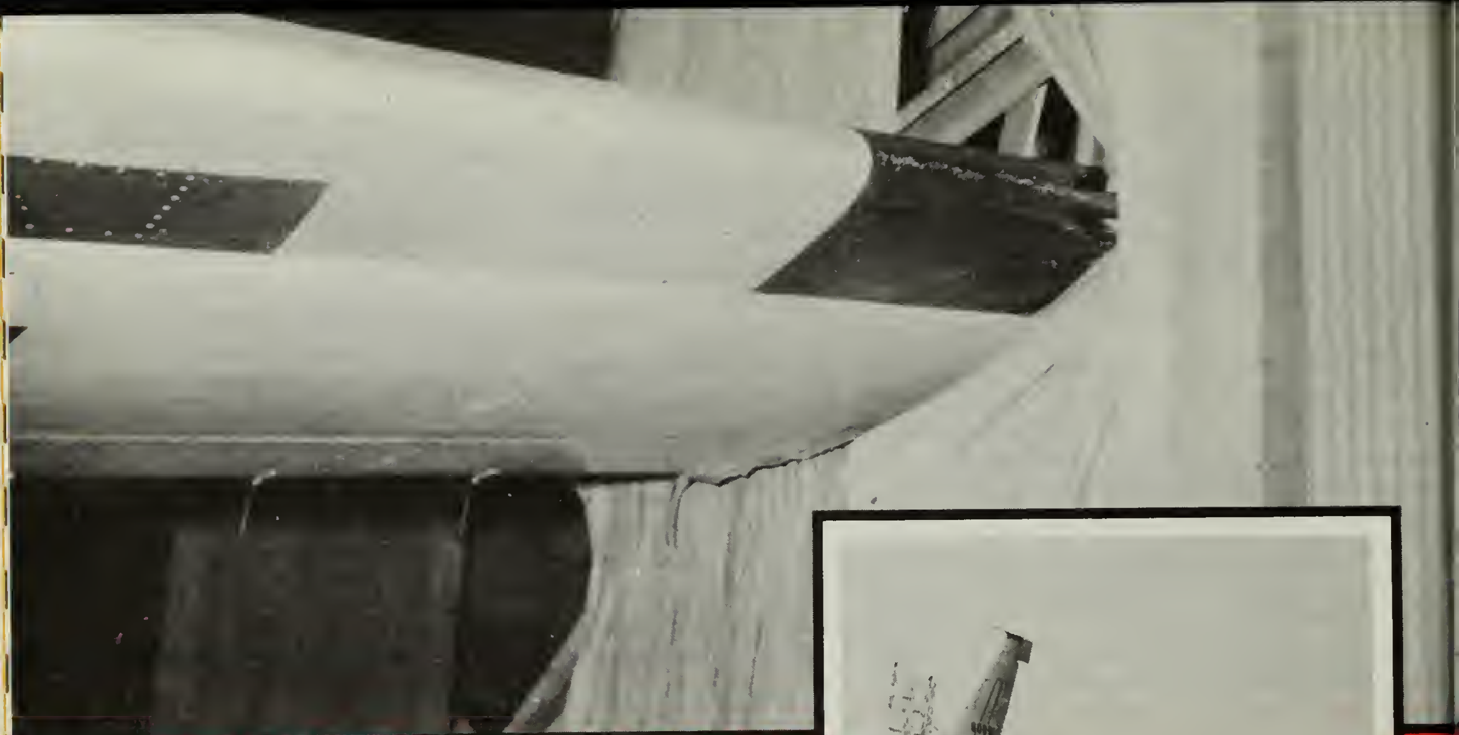
The Recommendations

Based upon the results of our investigation, we offer three recommendations in the event you should suddenly find yourself vying for cockpit space with that huge balloon.

- Don't Release the Lapbelt—This may sound obvious, but during the surprise and alarm of an airborne inflation, you might be tempted to go with your first impulse, namely, to relieve the lapbelt tension by releasing the belt. If you do, your rapidly growing raft is going to try and drive you through the main instrument panel.
- Puncture the Raft if Possible—Due to the attach point design of the survival kit cover, it should raise up as much as an inch across the front, giving a wide target area for knife point deflation.
- Descend as Soon as Possible—If you're unable to relieve the pressure in the raft, descending to as low an altitude as possible will minimize the pressure differential between the raft and ambient air, thereby keeping expansion force to a minimum.

Although rare, inflation of raft in the cockpit is a very serious thing. Quick action with a knife, as illustrated, may be a crew's only hope.

Let us conclude by reminding you that we aren't trying to sound like alarmists—we recognize the probability of any one of you having to cope with an uncommanded life raft inflation is extremely small. Nonetheless, the potential is there and its impact is very serious. In the absence of more realistic simulation, we hope that this report will help you to be prepared for the unexpected.—Courtesy *Product Support Digest*, McDonnell Aircraft Company. ■



PILOTS BEWARE

MAJOR MIKE BLANCHARD
Directorate of Aerospace Safety

■ Did you know there are all kinds of people out there who are trying to help you have a taxi mishap? If you don't believe it, take a look at some of these set ups:

B-52 TAXIED INTO SECURITY POLICE VEHICLE.

Design of B-52 taxi lights limit side illumination

Vehicle without required lighting was allowed to operate on unlit part of airfield at night

Vehicle was parked on taxiway too close to centerline.

Flashers were not used on parked security police vehicle

Pilots had just taxied past area of bright illumination which reduced night vision

A-10 TAXIED INTO MAINTENANCE TRUCK.

Vehicle was parked too close to painted taxi line

C-130 RIGHT WING TIP HIT BUILDING.

Marshaller was directing aircraft from the left side — right side hit building.

C-130 WING TIP IMPACT WITH ANOTHER C-130 WING TIP.

Parking plan required excessive maneuvering without wingwalkers always available.

Poor ramp lighting.

KC-135 WING TIP DAMAGED BY SNOW BANK.

Snow removal operations not completed.

Taxiway centerline was displaced 100 feet but tower was not notified.

KC-135 LEFT WING TIP HIT LOADING RAMP.

Aircraft was parked too close to a stationary loading ramp.

Pilot requested a tow out but was convinced by maintenance that they could marshall him out safely.

Marshallers did not ensure w
tip clearance during taxi out.

C-141 LEFT WING TIP HIT BUS.

Bus left unlit and unattended.

Ramp lighting inadequate.

No taxi line on ramp

Army marshallers not familiar w
141.

F-4 LEFT WING TIP CONTACT POWER CART.

Power unit incorrectly position

Marshaller did not ensure wing
clearance prior to marshalling aircr

F-4 WING TIP COLLISION WITH A OTHER F-4.

Parking lines did not provide
ficient clearance.

Aircraft was improperly parked

F-15 WING TIP COLLISION WITH A OTHER F-15.

Taxi lines in arming area did
provide proper clearance.

Snow not completely cleared fr
arming area.

3 AIRCRAFT TAXIED INTO LADDER.
amp was unlit.
o marshallers available.
axi lines covered by snow.
ircraft ladders left out on ramp.
adders were painted dark with no ective tape
How can we as pilots avoid these e of pitfalls?
Keep head out of the cockpit when aircraft is taxiing
Stay on the taxi line and ensure tacles do not infringe on your taxi ce from the side
Use very slow taxi speeds in con- ted conditions
Call for wingwalkers if in doubt as wing tip clearance — required when than 25 feet.
Park it if the obstacle is less than feet.
Don't trust a marshaller implicitly— can err also.
Use the rest of your crew to help ar.
Review AFI 60-11 periodically.
The key to all of these tips is "USE OOD JUDGMENT." Remember, the final analysis AFR 60-11 levies responsibility for safe taxi clear- ce on the pilot. So if you cannot sitively ensure you have safe taxi arance — don't taxi. You may save cle Sam some money and yourself ed face. ■

Beware Of Low Flying Bread Trucks

MAJOR MICHAEL D. BLANCHARD
Directorate of Aerospace Safety

■ Have you ever been on the flight line and seen a maintenance van, more popularly known as a bread truck, go flying by in front of you? I don't mean speeding, I mean flying by on its side 5 feet in the air. It does happen.

During an operational exercise a bread truck was blown over on its side by a parked KC-135. The driver of the van noticed that engines 1 and 2 were running so he drove around to the other side of the plane assuming that nr 4 engine would no longer be at a high power setting as it is when used to start 1 and 2. When he drove into the jet blast he ended up on his side sliding down the ramp. Luckily, he was wearing his seat belt and was not injured.

Another jet blast incident occurred when a C-5 was making a 180-degree turn at the end of the runway. Even though he was using marshallers and minimum power for the turn he blew away a set of VASI lights. Cause of this one is both operator and supervisors. Both were aware of the potential hazard and neither took appropriate actions to prevent the damage.

The third mishap occurred during a C-141 engine start. Prior to engine start the scanner was completing his final walk around and he noticed several helicopter parts and mattresses between 40-100 feet behind the aircraft. He asked personnel in the area to help him move the gear farther back. An Army captain informed him there was no need to move anything, as nothing could be damaged. The scanner complied with the captain's wishes, advised the pilot of the situation, and recommended that engines 3 and 4 be kept to minimum power settings until well clear of the area. You guessed it, the jet blast blew the mattresses and parts over and damaged an Army helicopter blade.

I hope the moral of this story is clear: Whether you are a crewman, maintenance man, or supervisor you must be aware of the extremely hazardous potentials of jet engine blast. An ounce of prevention by appropriate personnel in each of the three cases cited would have saved "Uncle" 10,508 dollars. ■

Whiteout: A Rotary-Wing Winter Menace

LT COL ROBERT L. GARDNER
Directorate of Aerospace Safety

■ Winter weather brings many increased risks to flying, but one of the more serious hazards for helicopter operations is rotor-induced whiteout. All aviators have to contend with natural whiteout conditions where snow covered terrain blends into a milky sky; low visibility and blowing snow may contribute to the loss of visual references; but helicopters pilots are faced with generation of their own snow cloud during operations close to the ground.

When flight over loose powdery snow is encountered, a helicopter pilot can find himself in the middle of a ball of swirling, visually cue-less atmosphere. This is an ideal condition for inducing serious disorientation in which you may have the sensation of moving in one direction when, in fact, you are stopped or moving in another direction. The wrong flight control input or pilot freeze-up on the controls are possible results which can lead to disaster or, at the least, a very uncomfortable situation.

Lack of familiarity with a snow environment, not anticipating or being prepared for a sudden whiteout condition, and continuing to press on in a recognized hazardous situation are the most frequent contributors to whiteout mishaps. See how many of these factors are illustrated in the following.

Whiteout Mishaps

While flying at 700 feet AGL in a remote arctic location, an H-43 pilot encountered the first natural whiteout of his career. In an effort to establish visual reference with the snow covered terrain he reduced airspeed and lowered altitude until the undefined, irregular white surface came into perspective. Flight was continued in a slow high hover, maintaining visual ground contact, until suddenly the aircraft started to become engulfed in a rotorwash induced snow cloud.

tunately, an arctic-experienced ructor pilot in the left seat got on controls and maneuvered the heli- ter out of the circulating snow ore complete outside references e lost. The crew then got on in- ments, climbed to a safe altitude, proceeded to home base. The t who got them in the high accident ential condition had only recently ved at the northern location and no previous snow environment erience. To this day he vividly lls the apprehension and tense- s that he felt developing in the ter of a few seconds as the visual s he was relying on started to dis- ear.

s an OH-58 pilot taxied for take- he hovered slowly at a three-foot ude over loose falling snow. The rwash created a whiteout condi- , and the pilot became disori- d, lost control, and crashed. The t had not received any instructions cerning whiteout resulting from ering too low and too slow in loose falling snow.

UH-1 pilot, approaching a land- zone, flew into heavy blowing w and lost control which resulted he helicopter rolling on its side as uched down. The pilot was not iliar with procedures in the oper- s manual and continued to land r encountering a whiteout condi- .

Vhile on a search and rescue mis- in mountainous terrain, an H-3 ountered marginal weather with a und cover of fresh snow. After ing the objective, the helicopter landed at the site; however, take- was delayed for a short time due to poor visibility. The first takeoff was aborted because of rotorwash-induced whiteout. A little later a second takeoff was accomplished, but after 15 minutes of hovering around, a landing was again made due to limited visibility and lack of ground references. A third hovering takeoff was attempted, the pilot became disoriented, began inadvertent rearward flight and froze on the controls. As the helicopter moved rearward, the main rotor blades struck the hillside causing the blades to strike the cockpit and chop off the tail boom. The aircraft commander was fatally injured, two other crewmembers received minor injuries, and the H-3 was destroyed.

Recognize The Hazards

Knowing the snow condition will give you some idea of what to expect during takeoff and landing in snow environments. The snow may be well packed, crusted or frozen to ice, thereby presenting very little problem. At other times, it will be light, loose, dry and powdery and easily converted to a swirling snow cloud. The following points can help you determine the snow condition.

Know The Snow

Where the temperature is −20°C. or below, fresh snow will be loose. Any time a wind of 10 knots or more exists, you can anticipate blowing snow. Open areas may be blown clean of fresh snow deposits. However, huge snowdrifts will develop when terrain features such as trees and crevasses block the flow of air.

Loose snow that has been exposed to the sun for three days or more will form a crust. The depth of this crust will depend on the time it has been exposed to the sun. Overcast conditions will not cause the snow to crust. The rotorwash of a light helo may not cause a breaking up of the crusted snow, while operation of an H-53 over the same area could cause the crust to break up in pieces.

Footprints of people or animals provide an indication of the snow condition. Deep prints indicate snow is loose and blowing snow will be encountered when landing. If a person is seen standing atop snow without sinking, you can anticipate crusted or frozen snow.

A low, slow pass will give an indication of the snow condition. If the rotorwash creates a snow cloud, you must initiate the proper flight technique for a safe landing.

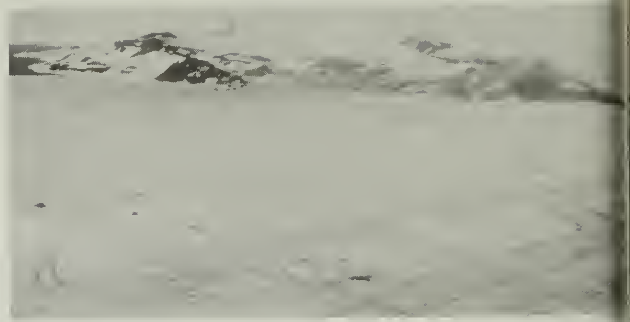
The following techniques are recommended for helicopter operations in a snow environment:

Taxiing in the Snow

The helicopter produces the greatest amount of rotorwash when hovering. This creates a very hazardous condition for taxiing skid-mounted aircraft. This hazard is not as serious for aircraft with wheels. These aircraft can ground taxi safely to the takeoff point with only minimum pitch, thus reducing the force of the rotorwash.

If you must relocate a skid-mounted aircraft from the parking area to the takeoff point:

Ground taxi the helicopter to a point where it can be flown to a hover and air taxied at a high taxi speed



Whiteout: continued

(approximately 10-to-15 knots). The reason for ground taxiing is to permit positive control of the aircraft when in close proximity to other aircraft and obstructions. At this low altitude, the rotorwash will produce an area within the snow cloud where forward visibility can be maintained with the ground. The type of aircraft being flown will determine the size of the clear area. The air taxi speed should be slightly below effective translational lift airspeed. This technique allows the aircraft to be flown forward of the snow cloud where visibility is not restricted by blowing snow.

Avoid taxiing in the near vicinity of another aircraft that is running up or taxiing. Sufficient time should be allowed for the snow cloud produced by other aircraft to dissipate before taxiing through the area.

Takeoff

The techniques used to take off from snow will vary depending on the type aircraft you are flying; however, the doctrine for this type of takeoff is common to all helicopters. The following takeoff techniques are recommended:

Ensure the skids are free from obstruction and not frozen to the ground.

Where the snow is only a few inches thick, application of pitch to the blades before takeoff may blow most of the snow away from the takeoff point, thus reducing the density of snow that will be lifted on takeoff.

After the above procedures have been accomplished, stabilize the aircraft on the ground until the snow cloud dissipates. When ready for takeoff, position the cyclic for takeoff. If there are no obstacles along the takeoff route, it should be positioned to achieve a maximum performance takeoff attitude. If the takeoff is to be made over an obstacle and adequate power is available a near vertical ascent should be made.

> **". . . blowing snow will increase and reference to the ground will be temporarily lost. Maintain heading and altitude by reference to the flight instruments."**

When ready for takeoff, make a continuous application of torque. The aircraft should have no forward movement until clear of the ground. Sufficient torque should be applied to ensure a positive rate of climb. As the aircraft begins to climb, blowing snow will increase and reference to the ground will be temporarily lost. Maintain heading and flight attitude by reference to the flight instruments. When clear of the snow cloud, adjust flight attitude and torque so as to achieve normal climb airspeed and rate of climb. Throughout the maneuver, the copilot should monitor the engine and transmission instruments.

Before takeoff, you should discuss with the copilot what action will be taken in the event of an engine failure or rpm bleed-off while in the snow cloud. The normal procedure for single-engine aircraft is to maintain takeoff heading and to perform a hovering autorotation. The copilot's responsibility is to assist in identifying the failure and height above the ground during the descent. If flight is conducted in a multiengine aircraft, you must determine before takeoff if single-engine operation is possible based on gross weight. If it is determined the aircraft must be landed, the pilot should beep up the good engine to gain maximum power and position the aircraft in a landing attitude. Power is added during the descent to cushion the aircraft onto the ground.

Landing

When landing a helicopter to snow covered terrain, you can anticipate being engulfed by a snow cloud unless the proper landing technique is used. This technique requires the aircraft to be flown in front of the snow cloud until it makes contact with the ground. Although the specific technique will vary for each type of helicopter, the basic principle for snow landings is the same for all helicopters. Remember that no two snow landings are the same. You must always anticipate the unexpected and be prepared to cope with any condition that confronts you. Use the following techniques when landing to snow-covered terrain:

Before initiating the approach you should learn as much about the touchdown area as possible, e.g., condition of the snow, slope of the area, obstacles. If the landing is made to an improved landing site, some forward airspeed on touchdown is desirable. Where there are no unknown obstructions, a running landing is t

st procedure to minimize blowing ow. However, when landing to an ıfamiliar or remote site, forward eed should be dissipated upon touch- ɔwn. The approach should be anned so that only minimum power required to terminate. If there are obstacles along the approach path, shallow approach is recommended. an approach angle greater than a rmal approach is required to get to a confined area, it is preferable terminate the approach out of ound effect above the touchdown oint and hover vertically down- ard. The rate of descent will de- nd on the condition of the snow. very loose snow, a slow descent ll blow the snow away, allowing u to maintain visual reference with e ground. This procedure permits eater control when in the snow oud.

The initial position of an approach the snow is the same as any other proach. The primary difference is the last 50 feet. Instead of making e normal deceleration below effec- e translational lift airspeed, you ust maintain this airspeed until just fore touchdown. This allows you to ep the helicopter in front of the ow until touchdown, after which e aircraft will become engulfed in e snow cloud. A slight leveling off required to maintain airspeed. For- ard cyclic must be applied to main- n speed. As the aircraft descends an in-ground-effect altitude, blow- g snow will develop to the rear of e aircraft. At this point, begin a de- celeration. After the aircraft has begun to decelerate, it should be positioned in a landing attitude. If inadvertent ground contact is made due to poor depth perception it will not be hard enough to damage the aircraft. Once contact is made, reduce torque until the aircraft is firmly on the ground. Never plan to terminate the approach to a hover as disorientation can occur easily in a snow cloud.

The most difficult aspect of the approach is determining your height above the terrain. Trees or other terrain features located in the near vicinity of the landing area provide good ground reference. If none of these objects are available, it may be necessary to drop an object or smoke grenade near the touchdown point.

Once on the ground, the crew chief should conduct a walk-around inspection to ensure the aircraft is positioned securely on the ground before shutdown. If on a slope, precautions must be taken to ensure the aircraft will not slide downslope after shutdown.

"Although the specific technique will vary for each type of helicopter, the basic principle for snow landings is the same. . . ."

Night approaches to the snow are normally made to a reference point on the ground, e.g., tactical landing light or runway light. These devices provide a good reference for judging angle of descent and rate of closure. When executing a night approach to a tactical landing site with lights, always plan your approach to land short of the touchdown point. This technique ensures that you will not overshoot and have to decelerate rapidly in a snow cloud. Additionally, by shooting short, it allows you to maintain airspeed after the level-off, thus keeping the aircraft in front of the snow cloud until touchdown. If the landing light or searchlight is used during the approach, position these lights so the beam is beneath the aircraft so that reflection from the snow cloud will not blind the crew.

En Route

In a nontactical environment, aircraft will normally be flown at an altitude and airspeed where the rotorwash will have no effect upon loose snow. In a tactical environment, however, you must fly at terrain flight altitudes to avoid destruction by threat weapons. Because terrain flight altitudes are so low to the ground, rotorwash creates a signature identifiable for several miles.

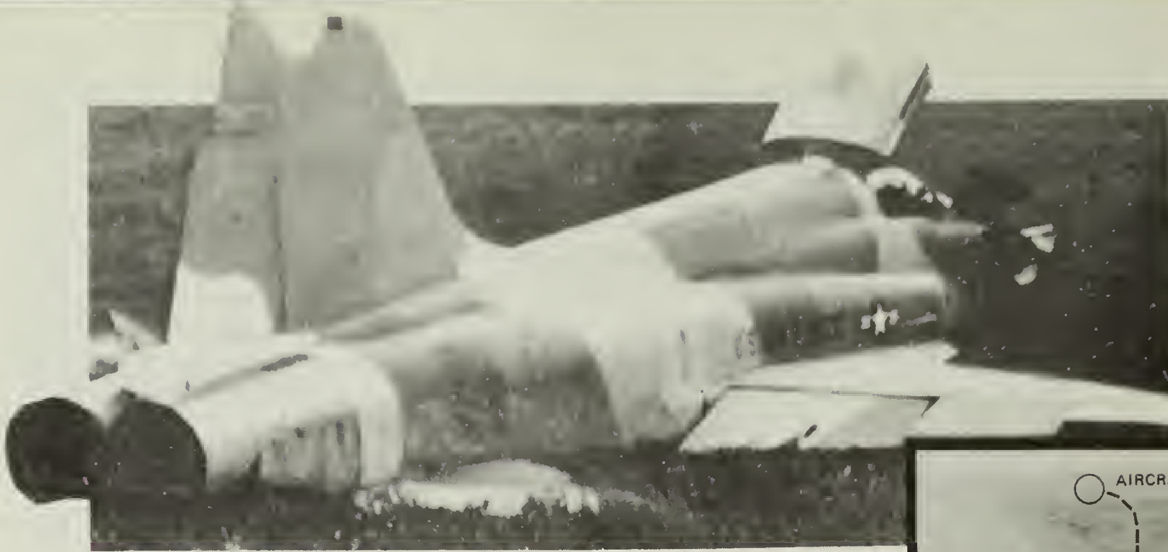
To minimize the effect of rotorwash on loose snow, maintain an airspeed of 40 knots or greater. At this airspeed the rotorwash is displaced horizontally.

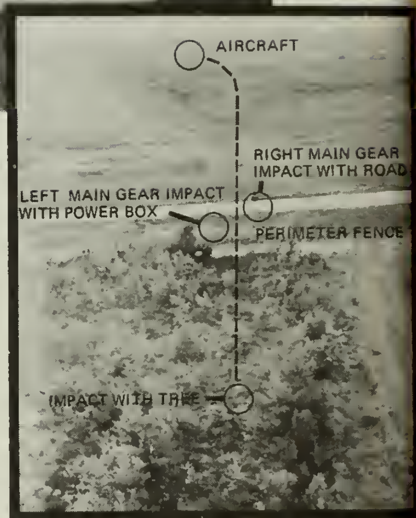
Terrain features that served as good references for one mission may not be recognizable on the next flight. Snowstorms or winds can change the appearance of a snow-covered area in a matter of hours. An awareness of this phenomenon is essential to ensure accurate navigation.

Summary

Winter flying requires specialized techniques. By knowing the hazards and being prepared to cope with them, safe operation can be conducted. Take a look at your helicopter's flight manual and review the cold weather procedures. See what it says about takeoff and landing in snow conditions. Discuss the procedures with an old head or someone who has been there before. Try and learn from their experiences. Awareness and training are two essential weapons in the battle against whiteout mishaps.

Much of the foregoing was adapted from the US Army *Flightfax*. ■





F-5, above left, followed this path during short landing caused by illusion produced by terrain.

LANDINGS

MR. ROBERT W. HARRISON, Editor

■ The December 1978 *Aerospace Safety* contained an article titled "No Short Landings?" The last paragraph read as follows: "This is the December issue of *Aerospace Safety*. We sincerely hope that when next December comes up on the calendar that we can report 'no short landings this year'."

Well, it didn't turn out that way. In fact, 1979 wasn't a very good year. Frustrating is the fact that we keep having the same accidents, year after year. We merely relocate them. For example:

- An F-5 received major damage when it landed 300 feet short of the overrun. This appears to have been a classic visual illusion case. The approach is over a valley with a floor 450′ below runway elevation. The slope from the valley floor toward the runway can fool a pilot into believing he is high. The scenario then reads like this: An early turn to avoid flying over the valley; having changed his pattern and perceiving that he is high, he reduces power; a high sink rate develops; when he sees this, he adds power but it's too late and a short landing results. Such was essentially what happened in the F-5 mishap. That was not an original: the files contain many such cases.

There are several things that can be done to prevent this type of mishap. First there is smart flying. The pilot must use the aids and not let the lay of the terrain determine his approach pattern. The aids include speed, VASI, glide path indicator, VVI. FSOs can help by recognizing the problem and discussing it in safety meetings. IPs can warn students of the hazard and demonstrate proper procedure.

- It was a bad day for a C-9 pilot who had just about nothing going for him. On a GCA, the pilot lost visual contact with the runway between DH and touchdown. He attempted a missed approach but struck the overrun 526 feet short of the threshold. The aircraft bounced and landed again 51 feet from the threshold. The aircraft then swerved and hit a couple of runway lights before the crew got things under control.

Now to the fine points. The weather was near minimums. While the aircraft was on final nearing DH, a fog bank moved over the first 2,000 feet of the runway. After passing DH, the pilot apparently became somewhat disoriented after losing his visual references and allowed an excessive descent rate to develop. The base Inter Service Support Agreement didn't ensure removal of snow from the overruns. Consequently, snow and ice had accumulated, and when the aircraft touched down hard the first time, ice ingestion failed the left engine. On the second touchdown the pilot, not realizing the left engine was out, tried to place both engines in reverse. The asymmetrical thrust caused the aircraft to swerve and hit the lights. The aircraft received severe damage but there were no injuries.

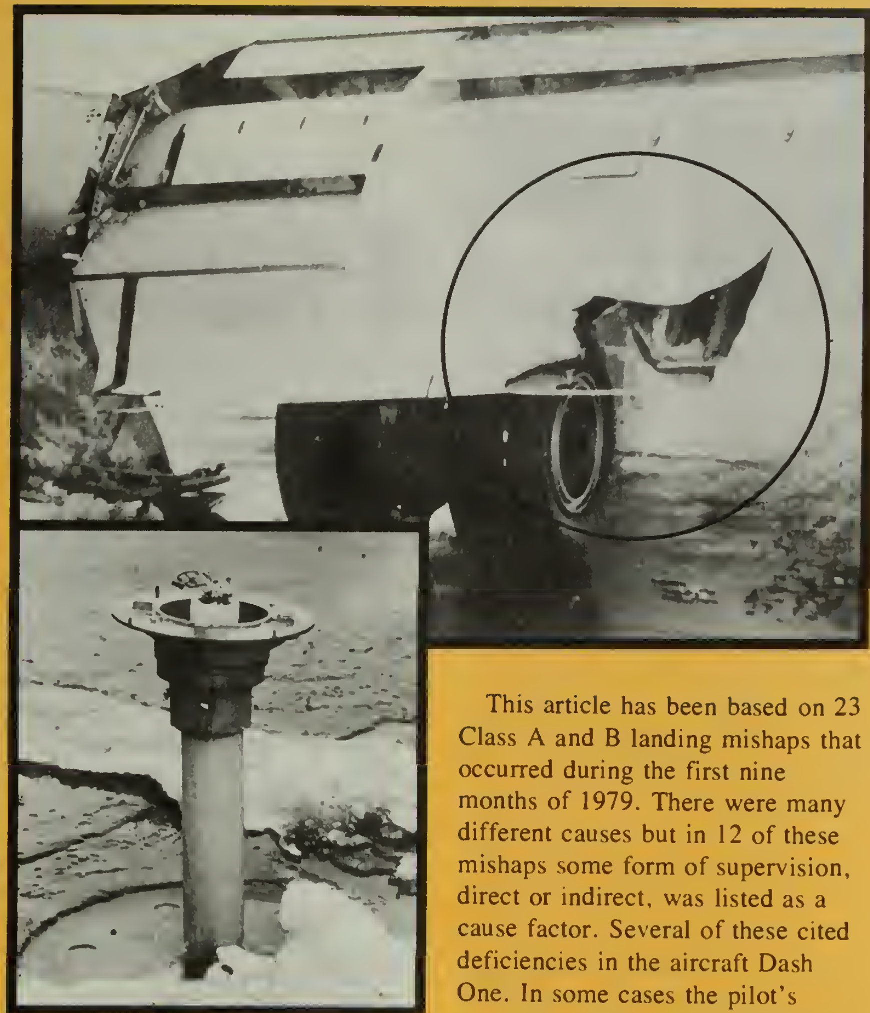
- Several things that probably could have been coped with individually combined to cause a Class A mishap. The mishap aircraft was nr 3 in a flight of 3 landing out of an ILS approach.

A heavy snowstorm had deposited more snow than the removal equipment could handle. During the

proach, snow was falling and WX
:nt down to 300 and one.
ıfortunately, the pilot was not
aring his prescription lenses. He
ıs left of course and failed to
rrect. He asked for the sequenced
shing lights and approach lights to
turned down, but his transmission
ıs not heard.
Apparently, the pilot was
thered by: (1) the poor visibility,
inadequate vision due to lack of
prescription lenses and (3) the
hts. However, rather than go
ound, he attempted to land. The
craft landed on the left side of the
ıway, hit a snow bank and was
stroyed. Ironically, even with the
ow plows not being able to do a
mplete job, cleared width of the
ıway was 125 feet, more than
equate.

Seldom do accidents result from
ngle identifiable cause, as we
e seen from the above examples.
ch was the case with an F-4. The
in the rear cockpit was attempting
ight landing from a GCA.
ichdown was short of the
eshold lights and well to the left
. This crew didn't get any help
en the aircraft rolled over the
K-9 barrier ramp which had been
ently repaired. The right main
ke through the surface and was
ared from the aircraft. The crew
ked out and didn't get hurt. Crew
rdination appears to have been
than excellent.

Our old enemy wake turbulence
arently combined with
equate training and weak or
ng guidance to produce a minor



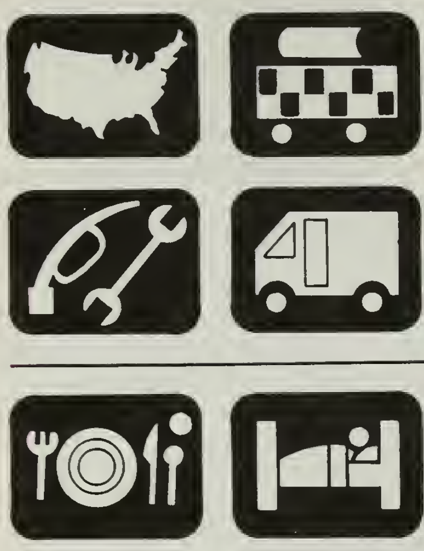
Touchdown in snow and ice covering overrun resulted in ice ingestion fouling an engine. Flap damage occurred in collision with runway lights.

mishap. Minor, in this case, meant a $92,500 repair job.

Number 4 in a flight of 4 probably got below the rest of the flight and into their wake. Not having a good grasp of the lift available in the landing configuration at AOA above 10, and hit by the wake turbulence, the pilot failed to stop a high sink rate and let the aircraft hit short and hard. The right main gear and tire failed but the pilot was able to take it around. Then he made an attempt at an approach end arrestment. The right main gear wheel caught the cable which disengaged after 600 feet. The aircraft drifted off the runway and stopped.

This article has been based on 23 Class A and B landing mishaps that occurred during the first nine months of 1979. There were many different causes but in 12 of these mishaps some form of supervision, direct or indirect, was listed as a cause factor. Several of these cited deficiencies in the aircraft Dash One. In some cases the pilot's training was considered inadequate. Other factors included weather, maintenance tech data, and poor pilot technique.

The most distressing thing is that as one reads the reports there is the feeling of having been there before. While the pilot is always the first one on the scene of an aircraft accident, he is not the only one who could have prevented it. His supervisors, maintenance people, engineers, handbook writers – all have a part in ensuring that the pilot, the aircraft and the operating procedures are capable of doing the job safely. ■



X-COUNTRY NOTES

Some thoughts about a group of folks that are critical to a smooth and safe airfield operation.

IDEAS AND NOTES

■ **WHAT'S A 271?** There is a small group of people who grease the wheels of airfield operations. If you don't know the difference between a 271 and a 781, and you are an airplane operator, read on and you may learn. One of the most challenging and variety-packed enlisted career fields is the Base Operations Dispatcher, 271XX. I need to point out that 271's are also used in some command's and locations as Alert CQ's, command post flight followers, etc. Predominantly, however, these are the people you find behind the base ops dispatch counter.

I think there is a need to pass on to crewmembers what goes into the making of a dispatcher. First, there is *no* tech school for these people — that's right, no formal school to teach them their job. So what you have are individuals usually right out of high school, thru basic training, and shipped to their PCS base to pick up their career field through OJT processes.

There are some excellent CDC's for the 271 folks, but essentially they arrive at Podunk AFB not speaking airplanes at all. In no time they learn FLIP, 175's, FAA, radios, weather, protocol, MAC passenger service, etc., etc. Granted, at some locations, they are pretty much only dispatchers, but more often they are part airfield manager, part welcome wagon, part tour guide, part motor pool dispatcher, part radio operator, part flight planner, part meal orderer, part runway inspector, etc., and *all* diplomat. They take noise complaint calls and receive aircrew complaints — usually in stride. I have been to more than 60 bases in the past year and can say that by-and-large this is one of the most professional and motivated group of enlisted folks I have run into.

Aircrews need to have a little empathy before they rant and rave at the counter. The dispatcher will be happy to take down your complaint and attempt to help. Often the problem you have is not within their power to magically fix. Take a deep breath and cool off before you head for the nearest dispatcher with your problem. Remember that you are talking to non-aviators who are doing their best to learn your business and provide professional service and assistance. They come in all shapes, sizes and backgrounds. They work some strange shifts and hours, perform some weird duties and are still called upon for bay orderly, CQ, clean-up details and other non-dispatch-type duties. They have headaches and bad days just lik[e] other folks. They are the backbone of a smooth and safe airfield operation — work with them and they'll do their best for you!

DON'T STEAL THE BOOKS — Several base ops counters this past trip had out-of-date FLIP books and charts about a week after the change-over date. Abo[ut] half of the problems were ops personnel posting and the other half were crewmember larceny. First — don't steal the books; if you need one, go to the dispatc[h] counter and ask. Most often the[y] will be glad to give you one. Second — if you do insist upon stealing the books, don't put the out-of-date pubs in the rack. They're harder to notice and somebody may flight plan using your out-of-date charts and los[e] their assets because of it.

SMALL CERTIFICATES — about 1 February 1980, we will have available for Rex Riley list base[s] 8 x 10½ inch Rex Riley certificates which can be imprinted with "Billeting, Inflight Kitchen, etc.," to show that the Rex Riley award covers all agencies. We will be able to se[nd] 10-15 copies to bases that request them. Please! We will honor only written or telephonic requests from Chiefs of Airfield Management (to prevent duplicate requests). So, after 1

THE

REX RILEY
Transient Services Award

AJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

ebruary, check with your airfield anager to see if he has ordered em from Rex Riley, AFISC/ EDAK, Norton AFB, CA 92409, AUTOVON 876-2113.

ETAINED AWARDS

LITTLE ROCK AFB—Lots of traffic tle, big, civilian and military) ake this place a spot for gilance. Ramp space is entiful, but the pattern can be turated! Good people providing od service.

GRISSOM AFB—Nasty winter nds and weather, but these ople are aiming to provide od service. CAUTION: REX otted lots of gravel and ncrete chunks on the ramps d especially on the transient rking area. Could be food OD) for a hungry engine and n an otherwise super stopover. atch for it!

MINOT AFB—Ditto on the nasty nter weather, but again the not personnel will work hard at king your stay a safe and easant one. Watch the transient mp! It's been normal to find veral helicopters and T-Birds rked there besides transients. s makes taxi tolerances tight, d with the winds and ice up re, could lead to a taxi crunch. me of the best meal and billet ilities we've seen recently. A od quick turn or pleasant RON. p by.

EESE AFB—Down Texas way n all that open space you can falsely lulled into being alone. N'T! There are loads of white rockets and whistles in the pattern and area. Keep your eyes open, but don't avoid Reese 'cause they'll give you a good stopover. Standard UPT operation though, so plan on maybe only a full stopper.

ELMENDORF AFB—Facilities and TA services were super! A pretty specialized operation with some strange environmental and weather problems, so do your homework well! Attitudes are good and the folks will work to give you a good stop or stay.

No new additions to the list, but we are generally seeing some improvements in facilities and attitudes. The name of the game is caring whether or not service is provided. A lot of hurdles and brick walls can be overcome by folks with a "can-do" attitude. CREWMEMBERS—The same rules apply! Your attitude and how much you try has a direct bearing on how your service is. People will go a lot farther if you are trying, too. Make reservations if you can, call ahead with special requirements and be emphatic of the local problems and limitations. Good service is a two-sided coin! Good turn or bad—fill out a questionnaire, leave it with the base ops folks and send REX a *copy*. Rex Riley, AFISC/ SEDAK, Norton AFB, CA 92409. ■

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valparaiso FL

Report Of A Pilot Giving Flight Training On A Jet Transport

■ I must tell you about my experience with an airport fire department during my last flat tire incident. We pulled off the runway and called to tower to inform them of our situation. They said they wanted to call the fire trucks because they saw some smoke coming from our wheels. We said, all right, and then we shut the engine off.

By the time I had got out of my seat, the engineer had both doors open. As I looked out the passenger door I could see that all four tires were going flat and there was an average amount of smoke coming from the wheels. I told them not to worry nor get excited and then walked to the forward galley door to look at the right gear. I also noticed some smoke but I considered it normal under the circumstances.

When I walked back to the forward lounge, I noticed the engineer standing in the doorway and jumping up and down. He wasn't moving — just jumping up and down and shouting in his native tongue. Then everybody except the engineer (he just kept jumping up and down) started running up and down the aircraft. I got out of the way just in time to avoid being knocked down. I knew a little of the local language but they were all yelling and talking so fast I couldn't understand. I walked over to the engineer who was the only one left with me in the lounge and put my hands on his shoulders to stop him from jumping and then asked him to speak slowly and tell me what was wrong. The only word I got was "fire" and he pointed to the left wheel. I looked out and saw smoke but no fire.

By this time the entire crew had returned to the front door and in their excitement, almost pushed me out. They had all the fire bottles in the aircraft. About that time I could see the Captain was going to jump out the front door. I yelled "Don't do that or you'll break both legs." I told them to just be calm, that everything was all right. By this time, my statement was about as effective as shoveling water against the tide.

The Captain sat on the floor then twisted around and hung from the bottom of the door and jumped to the ground. (No broken legs!) Then to my amazement, all eight fire bottles were thrown out of the door. I could just see one of them hitting the ground and exploding. I have seen some juggling acts in my life but never one like this because the pilot caught every bottle, even though on the last one he fell down. It was fantastic, but I was beginning to get worried and I yelled down to find out what he was going to do and he said he was going to spray the wheels. I started to plead with him and I know I must have said "Please don't do that," at least twenty times and each time my voice got a little louder.

As he sat on the ground, he lined all the fire bottles neatly in a row. Then he jumped up and I know he never heard my pleading voice. He got one fire bottle and ran back to the left gear and standing about 2 feet away from it, he emptied the first bottle. I told him the thermal shock might make the whole wheel come off and if it does "you'll be killed." Each time he came back to get a fresh bottle, I pleaded and issued the above warning. After using the fourth (and each time he stood a little closer) I was exasperated; I just went over and sa down. That was one time I could have really used a drink. When I looked around, the engineer had pulled the inflatable evacuation slid out of the ceiling. I yelled, "no, no" and ran over to stop him from pulling the toggle, because I knew

e were no replacement slides at station, and that would have pped our training. As I looked of the door, the last bottle was ıg used and this time, the nozzle he bottle was right against the el.

bout 10 minutes after engine down, the fire trucks came ng up; one of them was pushing other because they could not get arted. The vintage of the trucks about 1940, or earlier. There e about twenty firemen dressed l kinds of attire, but mostly ts and no shirts. They all ɔed off the trucks and began ng and running over to the main . The next thing I observed was about the funniest sight I have seen in my entire life. All ty of these firemen started ɔing up and down and yelling at another. Nobody moved, they jumped up and down. I stood in loorway and laughed. This went or about 2 minutes.

ıe trucks were equipped with t twenty individual bottles of and a big water tank, which o be hand-pumped. The pilot ıg all this had gone to the truck hich the engine worked and ed to pull out the foam hose. When the firemen saw him they stopped jumping and proceeded to help him. He got right on top of the gear and released the foam. I closed my eyes and prayed. The fire truck without the operative engine had stopped about 35 feet in front of the aircraft, so about ten of the firemen ran over to it and pushed it under the right wing. Why they did not hit an engine nacelle I will never be able to figure out. They released all the foam from this truck on the right gear. I still continued to pray. I guess the good Lord heard me because nothing happened.

By this time a jeep pulled up towing a large ladder. All of the crew immediately disembarked in such a hurry that one mechanic (we always carry two) fell half way down to the ground. Fortunately, he only had skinned shins. I remained in the aircraft because I was afraid I would get run over if I was on the ground. I finally got up courage and went down, just as another smaller foam truck arrived. They decided to put it on the right gear and I ran about 100 yards in front of the aircraft. As they released the foam, the hose split and there was no way to stop it so it sprayed all over the wing. At about this time, a blow out plug fused in the right gear and I saw twenty firemen run by me going about 40 miles an hour. Then I looked out across the airport towards the operations building and here came a little old man carrying a bucket of water and running at top speed. The water was splashing all around and by the time he arrived at the left gear he had about a quarter of a bucket left. He lifted the bucket and gently poured it on the wheels and then he turned and walked away smiling.

By this time, I thought I could not laugh any more. I had noticed two C-119s circling the airport and I watched one of them on the final part of his approach. Evidently, the tower had closed the airport because as I glanced towards the tower I noticed they had shot off two red flares. It had not rained in this area all summer and everything is tinder dry. When the flares came down they landed in dry grass and started one of the biggest grass fires ever seen in the area. By this time there was no fire fighting equipment at the airport so they took a bulldozer and plowed up the ground around the fire to stop it from spreading.

This reportedly occurred at a European airport in the sixties. — Courtesy British Airways *Air Safety Review.* ■

For Pilots Only

continued from page 3

to luck out, in that there just wasn't anything to run into right at the time you were giving your entire attention to something other than flying the machine. In addition, a warning light at just the wrong time, losing sight of the leader at just the wrong time, encountering an unexpected threat, either ground or air, at just the wrong time, may singularly or all together, subtract from the attention that is required to fly the aircraft in the low level environment long enough to result in a collision with the ground.

Losing situational awareness – a term that has been coined recently – usually results from distraction on the part of the mishap pilot. Burying the nose while looking out the top of the canopy and not realizing the position of the aircraft until it's hopeless, has happened too many times in the last two years, and it looks like a dumb accident. Looking over the shoulder when under attack has also resulted in many pilots placing their aircraft in an impossible recovery situation.

Desire, motivation, ego – whatever – also is a big player in our DACT/ACT mishaps. An experienced pilot with a less capable aircraft, or the obvious novice, has the pride, ego, and the desire to get the more capable aircraft, or pilot, on film if he can. But desire, no matter how well motivated and understandable, will not increase the capabilities of the equipment or the pilot one bit, and we have another dumb accident when those capabilities are exceeded.

All pilots must have a knowledge of basic aerodynamics. Now you don't need a college degree in aero engineering to get this, but if you are to fly an airplane at its limits, you have to know what the limits are. You have to know what the signals are when you are approaching them, and what the first signals are when you exceed them. Pilots who are flying air-to-air combat must also know, in addition to the basic aerodynamics, the specific aero characteristics of their aircraft associated with high angle of attack maneuvering. In the middle of an excitin engagement, below the recovery altitude for your ai craft, is a very poor time to learn some startling fac about the aerodynamics of your airplane.

Discipline breakdowns. We are talking more abou the subtle discipline breakdowns where the rules ar stretched, limits are pushed, and procedures modified than we are about the gross and willful. This problem o discipline breakdowns is a tough nut for any of us t crack. The reason is that you get more victories – al though they are paper ones – when you stretch the rule and press on than you do when you follow the rule exactly. The fact that among the losses are destroye aircraft and fatalities doesn't seem to be balanced again that potential paper victory. Also, the problem with th subtle discipline breakdowns is that they may be tacit approved by the supervisory personnel at the unit, o perhaps even demonstrated by airborne supervisor people, and then if not encouraged, certainly condone by all.

It looks to us that, in over half of our mishaps, ther is a discipline breakdown of some type, whether inad vertent, or subtle and encouraged. We say that becau the rules which applied at the time of the mishap, cove ing the specific event attempted, simply were not fo lowed. Then once again – you guessed it – a dumb ac cident.

So the causes of our operational mishaps which unde lie that call are as follows: pressing and overcommitmen training and knowledge deficiencies, low event pro ficiency, poor briefings and failure to follow briefing skill and technique deficiencies, experience deficit distraction/inattention, and discipline breakdowns.

The types of mishaps in which they result – and makes little difference what kind of an airplane we ar talking about here – are pilot-induced control losse collisions with the ground or water, midair collisions, an

keoff and landing accidents. They account for approxi-ately 95 percent of all operational mishaps and always ıve. The underlying causes we have listed cover 95 ercent of the problems that generate the operations type ishaps. But there is something else.

It is not enough to know what kind of mishaps oper-ors have, and the underlying causes, the discussion still purely academic. The guts of the issue is: How do you e the information we know about our mishaps to pre-ent future mishaps?

And all of us agree, I hope, that the human factors of r mishaps are by far the most difficult to get our arms ound. When we have the human factor mishap, the sulting recommendations may change procedures, ange misison elements, cause retraining, change pro-iency requirements, expand briefings, restrict or limit w experience level pilots from the more difficult mis-ons, and discuss the best methods of improving dis-pline. Of course, when all else fails, we rebrief all ots. But all of these actions can be likened to what our affic folks go through. A curve is placarded for 45 les an hour; the driver tries it at 85 miles an hour and esn't make it. The action is to reduce the sign limit to miles an hour. So it goes with some of the actions at we feel obligated to take resulting from our oper-onal mishaps.

For the most part, we have good procedures. They olved from our combat experience, as well as what we ve learned while training over the past 30 years. The ssion is stated—we can't change that. It's a require-nt and is the reason we even have an Air Force. Our ots are well educated, trained; they're sophisticated ks much, much better equipped to fly the mission than s my generation. On the negative side, the mission is der than it has been in the past. We have less dead e per sortie and our margins for error are less than y were. But to balance that, the training is much more listic than it was in the past, and I am sure that our diness is also higher in a peacetime environment than it has ever been before. And that, after all, is why we train. But on top of it all, the stakes are much, much greater than they have ever been in the past for any military organization.

We think the situation boils down to this, and is why the article is entitled "For Pilots Only." When you strap yourself to a machine and your wheels go into the air, no book, no tech order, no regulation, no checklist, no supervisor, flies that machine. It's you, babes—you're the one who does it, and the only one. When those wheels go into the air, no pilot can delegate responsibility for flying the machine to another soul on the face of the earth. He can't delegate his altimeter, airspeed, attitude indicator, aircraft attitude, aircraft control, or aircraft position to another soul in the universe. Not a nav, engineer, copilot, flight commander, or command post. They can only help. The whole thing is his. Given his existing experience, skill, knowledge, training, and proficiency, he must then play the game as best he can with what he has.

Now there are lots of people who would like to take some of that responsibility, as long as they don't get any on them when things go wrong. Don't let them have it. Controllers, both military and ATC, will go so far, but when you are in real dire, deep trouble—unless things have changed since I've quit flying—their final transmission is "what are your intentions?" The classic reply, I think, to that transmission (and I don't remember the situation exactly, except it was bad) was when the pilot answered back "I intend to cry a lot."

But there is a control that you have as a pilot. In fact, you have the only control which will neutralize the threat to your clothes and bod, and that is to exercise what successful pilots of all countries' air forces have exercised, and that very simply is self-discipline. Now before you gag, read on just a little bit. You must discipline yourself to maintain situational awareness, to maintain attitude awareness, to know what your altimeter and airspeed say and what they should say, to know what you are up to and what you are capable of doing, when to do it, and make decisions and follow through. Nobody, but nobody, can do it for you.

continued

For Pilots Only

continued from page 19

In a good many of the mishaps of an operational nature we have had this year, we believe the problem was a breakdown or an absence of self-discipline. They go like this: In the past couple of months there was a fighter pilot who died because he lost track of where he was, and ended up with his nose buried at an impossible altitude for either recovery or ejection. What was he doing? He was looking out the top of the canopy in the kill kill kill mode while attacking a flight of two at low altitude who had not seen him. He probably had a smile on his face right up to the time the entire earth showed up in his windscreen.

There was an IP tanker pilot who ended up dead, along with four others in the airplane, because he just wasn't ready for the emergency that developed, and was generated, by a student pilot. He had probably been mesmerized by how well the student pilot was doing, to the point that he dropped his guard – something that no IP can ever do, regardless of aircraft type.

There was a bomber pilot recently who lost control of his aircraft somehow – we're not sure how – in a benign environment at the end of a mission on his way home. Whether his adrenalin level was still up to the point where he simply overcontrolled his aircraft while accomplishing some simple navigation maneuver, or he became distracted momentarily, we don't know. But both he and his nav are dead and the aircraft hit the ground because it had gone out of control.

There was a cargo IP on a touch-and-go who raised the gear instead of the flaps, probably, and right to this day we are sure he hasn't the foggiest notion of why he did that. He certainly didn't mean to. But he was on his seventh or eighth approach and somehow the head bone became disconnected from the arm bone. Pushing the wrong switch, pulling the wrong lever, continues to cause mishaps each year. The automatic actions only partially thought through are a problem of being human.

All of the mishaps we have mentioned, which are typical of many more that you can probably think of, have lacked that element of self-discipline as we have defined it. Pressing too hard too far, subtle discipline breakdowns, distraction, loss of situational awareness, overcommitment, and even deficient airborne supervision – all of those factors are still prevalent in our mishaps and all of them can be neutralized only by forcibly keeping aware of those potentials. The pilot then relies on his airmanship, common sense, knowledge, experience, and *self-discipline,* so that the traps are clearly and cleanly avoided.

Somehow, over the years, it seems to me that it has become unacceptable to enjoy flying. To enjoy it has somehow been equated to complacency, whatever that is. Perhaps you feel guilty when you are enjoying flying a military aircraft on a tough mission. Certainly you don't want anyone to know that really you are having one hell of a good time. But that's the way it should be. Our four stars, right down to our buck pilots who wear wings, flew or fly for only one reason when you get right down to it, and that is because they like to. They had or have pride in their ability to do it and are specifically proud that they have shown it in every war.

Few of our heroes in the flying business died in a dumb accident. Excluding combat losses, those who took pride and had fun doing the mission – those who had confidence that they were able to do the mission, and those who found better ways to do that same mission, are alive, or died of old age. They are the ones, for the most part, we look up to today. You know their names as well as I do. They didn't fly military aircraft because they didn't like to, and neither should you.

So the bottom line of this particular piece is this (I hasten to add, in my opinion): Enjoy flying our aircraft and doing the mission. Be good at it. Look for better ways to do it. Learn your fundamentals and boldly apply your knowledge, common sense, and above all, your basic airmanship in flying our aircraft today. Be proud that you can. As a pilot you have the whole thing. You can't give it to anybody, and if you want to, get out of the business. And finally, develop and maintain that self-discipline which keeps you out of the traps that some mighty fine pilots have fallen into and died. ■

FUEL DENSITY

by GORDON McKINZIE
Manager Fuel & Performance Control, United Airlines

Jet engines burn fuel at a voracious :. It is the responsibility of the ht crew to not only stay on top of l consumption relative to flight 1, but to know with confidence exact status of fuel quantity at all es. How confident are *you* in your lerstanding of what comprises cated onboard fuel? The anatomy hat load, from the time it is de- red into the tanks, until it finally s via a fuel nozzle deep in the ine's core, is not as straightfor- d as might be generally believed. measurement of fuel, as a heating duct at rest, or in motion, must be omplished with careful consider- n of its characteristic value of *ity*. The purpose of this article) provide some additional insight the subject of fuel density and influence of that parameter on ntity indication systems, flow surement systems, and the com- ion process.

sity 101 (Short Course)

bucketful of aviation kerosene ;hs approximately 14 pounds. same bucket, filled with water, hs 17 pounds, and when filled mercury, weighs 227 pounds. If are using a standard 2.1 gallon et, and the temperature at time of weighing is 60°F, we can describe the densities of these three materials:

Kerosene -	14.0 lbs ÷ 2.1 gals = 6.67 lbs/gal
Water --	17.5 lbs ÷ 2.1 gals = 8.34 lbs/gal
Mercury -	227.0 lbs ÷ 2.1 gals = 108.1 lbs/gal

A density "value" is nothing more than a *conversion factor*, which links the weight of a substance to the volume it occupies. It would be convenient if turbine fuel always weighed 6.67 lbs/gallon, but two factors come into play which introduce variability into the value of density: composition and temperature.

Fuel Chemistry

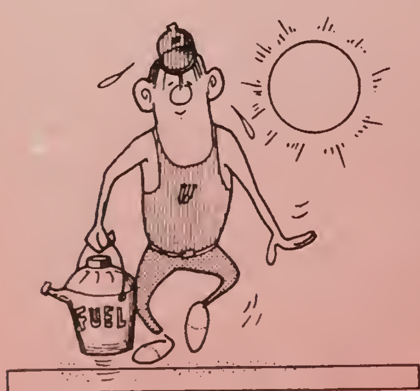
The real measure of a fuel is its heating value, or BTUs per pound, and engine efficiency is directly linked to the capability of the fuel to produce maximum energy output, or thrust, for the smallest amount of fuel consumed. What we are always looking for, as an ideal, is: (1) The most BTUs in every pound we burn, and (2) The most pounds in every gallon we buy. But these two requirements directly contradict each other, as will be explained later.

Both BTU content and density characteristics are permitted some latitude in the specification requirements we impose on our fuel suppliers – the "net heat of combustion" is limited to 18,400 BTUs per pound as a minimum and density can range from 6.452 to 6.944 pounds per gallon.

Today's actual density, although numerically different from that of the past due to slightly changing composition, has continued to remain well within these specified limits.

Why the changing composition? Our in-house experts tell us that since refineries have been forced to process a wider spectrum of foreign crude oil, a rigid compliance to previous density levels has become impractical. As a consequence, all refineries, with the concurrence of users, have had to permit some latitude within certain specification limits. The value of our average system density has been declining for many years, but has recently bottomed out and started to rise as a result of the heavier North Slope crude being refined.

FUEL DENSITY continued



Fuel Temperature

The effect of temperature on fuel density further complicates the process involved in precisely determining fuel loads. In a wide temperature range from −40°F to +100°F, the density of fuel can change by .5 lbs/gallon, which could result in appreciable "incremental" discrepancies in load when large fuel volumes are boarded. For this reason, our fueling distribution charts (for USAF read AFTO 781-H) are tabulated for fuel densities of 6.55 (low density) and 6.8 pounds per gallon (nominal density). When fuel density at the delivery truck is exactly known, fuelers are instructed to use such value directly to convert gallons to pounds, if the density is different from 6.8 or 6.55.

Density Accountability

To reiterate: Tank volume, measured in gallons, remains constant while tank capacity in pounds changes as density variations occur.

Fuel quantity indicators, which display fuel weight, will not gauge a tank filled with low density fuel to read as much as the same tank filled with higher density fuel. To reflect the correct gallons-to-pounds conversion process in the quantity indicators, on-board systems have been designed to sample and compute the effects of density as an integral part of the measurement process.

Densitometers

These are mechanical devices designed to directly measure the weight of fuel in the tanks, and function in much the same manner as a hydrometer, which contains a calibrated float which is buoyed at a depth consistent with the specific weight of the test liquid.

Compensators

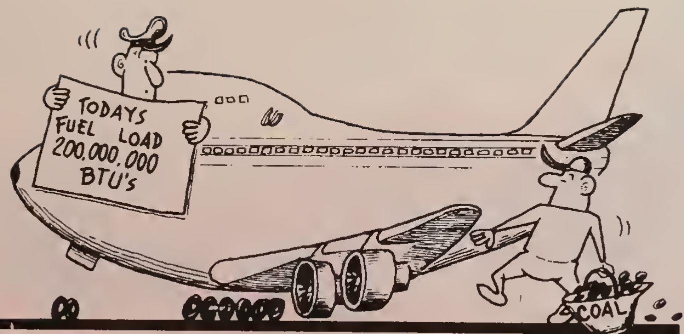
All of our aircraft flying today make use of electrical signals from fuel density compensators to convert measured fuel volume to pounds. Compensators differ from densitometers in that they provide no direct measurement of density, but operate electrically to generate correction signals to adjust any deviations from a "reference" density level.

The function of the compensator is to act as a condenser and to register electrically any change in its capacitance as a result of changes in the dielectric characteristic of the fue between its plates. The circuitry is adjusted so that a known density will be associated with a preset value, and any variation from this "reference" density, due either to temperature o chemical composition, will produce

an electrical bias signal which can b used to adjust the value of densit used in the gallons to pounds con version process.

The Forgotten Flowmeter

Another basic component whic must be included in our understan ing of fuel density is the fuel flo meter and its representation of fu consumption rate for each engin The subject is pertinent because ma believe that density adjustments remotely input to this system. Such not the case. Due to the fact that fuel is in motion, certain applicatio of physics make possible the co venient measurement of mass flo i.e., the direct readout in pounds unit time. Flowmeters are loca between the fuel control unit and nozzle assembly of each engine. Th reliability is quite good (they lubricated by the fuel passing thro them), and their accuracy is w within limits necessary for eng



oring purposes. Flowmeters are ed to be most accurate in the regime.

Fueling Process—ances

ause there is a high degree of lence in the accuracy of the ns boarded" number from the rucks, it is important that the reading always agree within ice to the before and after read-m the airplane gauges in pounds, rted to gallons. The Fuel Serv-orm has been specifically de-to accomplish this cross-check-ocedure.

application of the fueling toler-s designed to permit the trucks ver the correct, and on occasion, y more gallons than may be d by the aircraft, but never less. event the tolerance value itself eeded, gauging system errors be suspect and it is then required l tanks be dipsticked and dis-cies noted.

y and Combustion

ly, the role of density in the stion process should also be ned. While we tend to think of , high density fuel as being the dvantageous product for us in of fuel capacity (more pounds gauge for each gallon delivered ne truck), or overall cost (we el by the gallon—we can get ounds for the same price per , the fact that lower density enerate more BTUs on a per basis is not generally recog-Net heat of combination on a basis (BTUs/gallon) is di-roportional to density, but on a per pound basis varies inversely with density.

There have been instances where we have realized gains in volumetric heating value (per gallon), with a corresponding reduction in the number of gallons of fuel needed to complete a given trip in a given airplane. However, tied to this was the inevitable reduction in BTUs per pound. The impact was that a greater number of pounds of fuel was required to fly the trip, with an accompanying penalty in the cost of flying this incremental fuel. This often confusing concept can best be visualized by comparing physical properties of two different fuels:

	JP-4	Jet A	
Density			
Lbs/Gal	6.36	6.76	(increasing density) →
Volatility			
BTU/Lb	28,709	18,579	← (increasing BTU/Lb)
BTU/Gal	118,895	125,620	(increasing BTU/Gal) →

Our engines operate at almost 100% thermal efficiency to develop a net heat of combustion for whatever "unit" of fuel is burned. This heating value, in turn, produces thermodynamic relationships of pressure and temperature according to how much fuel is introduced into the combustion chambers on a rate basis. The fuel control unit then functions to sense and stabilize various engine parameters according to throttle commands.

Unfortunately, we do not have cockpit "BTU meters" to ideally represent the energy output of our engines, and since basic airplane and engine performance is expressed in pounds, consistence dictates that we continue to retain that convention and consider the combustion process in terms of gravimetric (i.e., pounds) heating value.

In playing the density game, then, keep in mind that our Fuel Purchasing Administration wants more BTUs per gallon, and that increased density will help them toward that end. Flight Operations, on the other hand, can burn fewer pounds each trip if the density is lowered and BTUs per pound are (accordingly) increased. It appears that a conversion to COAL (fixed density) might be the only equitable solution, once the engineering and Second Officer workload considerations are resolved! — Adapted from United Airlines *The Cockpit*, August 1979.

(Airline fuel is normally JET A, while USAF uses JP-4 and JP-8, densities for which are different from that of JET A. ed.) ■

PW: ENCOUNTERS OF THE WORST KIND

MR. WILLIAM E. HARDY • 3613 C CTS • Homestead AFB, FL

■ Becoming a prisoner alters the normal routine of life by disorienting the prisoner. Survival training can approximate real events but nothing rivals the new PW's stress. The lack of humaneness the captor may be prepared to show presents an additional problem. Combined with the novelty of the situation, this becomes sufficient to tax the coping capacity leaving the prisoner little energy for anything but survival.

Some philosophers who spent time in civil prison in the past have somewhat negated the difficulty of the situation and left us with thoughts like, *you can hold my body, but not my mind*. This denial to the captor may not be too difficult if captivity consists simply of room and board and loss of excursion privileges. Given the orientation of any of our potential enemies, it is unlikely that captivity would be anything other than a deliberately planned battle for that which we would hope to deny, *the mind*. The prisoner's hostage value is guaranteed. Unless escape is possible, the enemy has the certainty of some benefit by simply holding prisoners.

It seems uncertain which would be the greatest threat to the PW—a sophisticated captor who is prepared to wage a convincing battle in the arena of mind raping, or a captor whose efforts result in his extreme frustration being vented on the PW with very imaginative forms of violence. In either case, it is fairly certain that once the coffee, cookies, and chit-chat routine has failed to produce the cooperation desired, some physical coercion is going to be applied.

To address all the ways that psychological pressure could be brought to bear would be beyond the scope of this article and the desire of most readers, but I should like to discuss a method, or level, of applying stress that is capable of striking hard at the core of the individual. It is dangerous because it attacks something as basic in us as our desire to live, the need to maintain psychological equilibrium. The fact that to be human is to be endowed with a tremendous will to live is accepted without question. The body works constantly to keep the biological functions in balance, ensuring organic survival. The most timid, mild-mannered individual would fight like the proverbial tiger to obtain air to breathe. To the best of our ability we avoid what we interpret as pain and seek to live, with life being an end in itself if we have no other goals.

There is another need that, fortunately, few people ever becom acutely aware of, the need for ps chological survival. To maintain o mental integration, we will exert much or more effort as necessary continue to live. We avoid psych logical pain to the same or great extent than we do physical pai When the pressure becomes sufficie release from mental stress becom more important than life. If you dou this, consider the instances in whi people commit suicide because li is too painful for them to continue endure the stress they perceive wou be worse than dying.

In their search for explanations human motivation, social scientis have become aware of the need f mental balance or equilibrium. Wh all things are consonant, or in balanc we are at peace within. Our thinki and behavior are compatible sin we cannot tolerate incompatibili among our thoughts and/or our b havior, we take whatever measu necessary to reduce the lack of h mony or dissonance. If our thoug and behavior diverge, we will chan one or the other to bring them in li

If we are faced with conflicts our own ideation, the discomf forces us to react to reduce the c

t. For example, when you watch agician or an illusionist, you are ised because their act is intended produce dissonance. You know are not supposed to be able to oncile the confusion that exists n watching something occur that know is impossible.

issonance is not always fun, igh. Suppose you fancy yourself person who really lives by his/ own values and find that you e violated one or more of those ies. You have incompatible data. might rationalize that this should an exception, that some extenu- g circumstances existed, or face fact that you must face; you don't by them or you have just changed r values.

Value or attitude change is often arning objective that a captor has ned for the PW. If subtle appeals he intellect do not produce the ige and consequent increase in oitation potential, there are other cal methods to use. As any parent has children above the age of a months has learned, you may not ble to "change someone's mind" intly, but you can certainly change behavior if sufficient pressure pplied. It is not important that hearts are not in it, only that they loing what you want.

ne same applies to PWs. After a has shown cooperation beyond desires, written or taped propa- la or whatever was required, he be doing some considerable soul ching. His behavior has been at odds with that presumed of the professional soldier. He must reduce the incongruence that exists.

If he has truly resisted "to the utmost of his ability" as asked for by The Code, he can be comfortable in his own mind. He has done all that he could and all that could be expected, his best. If, however, his attitude was very unlike the Missourian and he had decided, *you don't have to show me, just hearing what you say you are going to do to me is sufficient,* then he is set for trouble.

After yielding, he has the gnawing realization that he might have avoided this, might have resisted harder, longer. He has no clear-cut justification for what he has done, unlike our first man.

To reduce this incongruence between his idea of "what he should have done" and what he did do, he must make some adjustments. The behavior cannot be undone. He can decide that it was not really that harmful, that he should not anguish over it, that he made the right decision. He may be happy enough with that for the moment but he has started a trend. Not only has he set himself up as a fruitful producer of what the captors want, he has also set himself up to continue — in small increments — getting in deeper. It will seem foolish to resist today something only slightly different from what was done yesterday.

As always, one day follows another and our man becomes more convinced of the rightness of his decision as he buries himself. If at some point

PW: Encounters of the worst kind continued

he decides to try to stop it all and bear sufficient abuse till he is left alone, then he is made acutely aware that he could have avoided all that in the beginning by the same type resistance he is now considering. He has not avoided anything, only postponed it. Given that, it suddenly seems more sensible to continue. Any established behavior pattern is more comfortable than an untried route. To maintain his inner peace, he is compelled to become more convinced of the rightness of his actions.

Unfortunately, one of the more common ways we convince ourselves of something is to find others who agree with us, or convince them that they should. The consequences and the continuing cycle here are obvious. If he convinces others, the problem is broadened. If he alienates them instead, he is cut off. If he becomes convinced that he has been wrong, he is miserable and significantly more vulnerable because of his low morale. There is no happy ending. If the enemy is perceptive enough to gather people like this together to reassure each other of their position, these people may soon begin to question the advisability or desirability of repatriation if and when it should become possible.

How does one prepare for, or combat, something like this? Reading articles like this is a beginning, for it indicates an interest at least. The next step is accepting the fact that the occupation you've chosen has greatly increased the likelihood of your becoming a prisoner some day. That is an event so unlikely for your hometown cobbler that he can completely dismiss the possibility of it occurring. For you to do the same would be less than wise. It would also make the event more traumatic, if it did occur, for there you would be witnessing the impossible come to pass and this time it is not in a magic show.

This denial is reasonably common, though. Survival and resistance instructors are frequently frustrated by their students' refusal to accept this possibility. No one asks you to believe that it WILL happen to you, just that it CAN. If I've not lost you yet, the next step is some attitude checking. A recent Chief of Staff of the Air Force popularized an idea about being "all the way in or all the way out" of the military. Are you all the way in?

Forbid that I say anything that could add to the problem of the exodus of fliers from the Air Force, but if you have any doubts, or have never considered it, a prison camp would be a heck of a place to decide you did not belong. It would be unlikely that you could defend ideas that you didn't hold.

This suggestion sounds grim, maybe even caustic though such is certainly not intended. Another step in preparation is to read the accounts of others who have been in similar situations. You cannot come to foresee every problem that another human may dream up for you some day, but you can eliminate a lot of surprises. Lastly, should the real event occur, your first encounter could perhaps at best be the worst one, after which the captor would, ideally, decide you are not the most easily exploitable person around and hopefully leave you alone.

I share with you the hope that such as this never befalls you. If it should, I give you this thought that does not come from my own experience, but from many former PWs that I have met and respect; no matter which direction you initially pursue, you can always stop but you can't back up.

ABOUT THE AUTHOR

William Hardy is a former Air Force Survival Instructor. His experiences include extensive travel throughout Southeast Asia during a four-year tour at the Jungle Survival School, in the Philippines, teaching, among other subjects, conditions of captivity. Upon the release of the PWs from that conflict, he was chosen as a debriefer for the men returning to Maxwell AFB during Operation Homecoming. No longer in uniform, he is now chief of a training branch within the 3613th CCTS, at Homestead AFB, FL, and Adjunct Professor of Psychology at one of the local colleges. The interest in PW affairs developed during his service continues now as a personal interest. ■

OPS topics

a Gotta Stay Alert

A recent near midair
ɔllision (NMAC) brought
ıt that a traffic advisory
not always a traffic ad-
sory. In this case one was
sued to the leader of a
ight of 2. Wing, how-
ver, was about a mile
way. Less than five sec-
ıds after the controller
ılled traffic at 2 o'clock,
miles (on Lead), a light
rcraft passed within 300
et of the wingie – too
te for an evasive maneu-
er. Ya gotta stay alert
ese days.

nter Wisdom

Be aware of the possi-
ity that significant icing
ıy occur in the area of
ermittent or no precipita-
n just beyond the bound-
es of a widespread area
steady precipitation and
ıch less icing may occur
thin the precipitation
a itself.

Of particular note is the stratocumulus cloud layer which forms in a cold air mass which has moved over a warmer water surface. As the low levels of the air mass gain heat and moisture very rapidly, the stratocumulus cloud layer is formed. Icing is often moderate or severe in the tops of these clouds. This situation is found frequently south of the Great Lakes and off the east coast.

Air Traffic Control departure delays seem to go hand in hand with low ceilings, low temperatures, and snow or freezing rain. . . . aircraft did experience long delays last winter awaiting takeoff (one hour plus) during heavy snows and we encountered particular problems with our three-holers. After the flights received takeoff clearance and when they were rotating for lift off, large amounts of snow and slush slid back along the fuselage and fed the No. 2 engine. Since engines don't operate too well on snow and slush, they experienced some compressor stalls and FOD damage.

Clear air turbulence is more common in the winter months because jet streams and storm centers are more intense and will have moved farther south than in summer. The arrival of these "winter winds" also means referring more often to the High Altitude Wind Trade Chart. – Courtesy *Flite Facts*, Oct 79.

Communications

From time-to-time we've printed items on the lack of or failure of communications. Most of those have been concerned with aircrew – controlling agency communication.

The following excerpts from a Dutch report, that takes exception to the Spanish report on the disastrous Tenerife collision of two 747s, underlines our concern.

". . . As I already said in the beginning of my argument, the eminent lesson to be drawn from this accident is the urgent need for improvement of the communication between aircraft and tower.

"Compared with other developments in aviation, radio-communication has lagged far behind in that the failsafe principle, which has been generally applied in modern aviation in the field of constructions, systems and procedures and which has materially contributed to a higher level of safety, does not apply to radio-communication. It is not failsafe.

"It is known that at several airports all over the world, and also during flights, a number of incidents have occurred in the last few years that arose from radio-communication. Although these did not result in accidents, some of them bore a great resemblance to the Tenerife accident. In my opinion the situation is more serious than is being presented. . . ."

". . . The problem of radio-communication is recognized. IATA has established a working group to study the best approach to handle this problem. The FAA has requested a number of research institutes to make a fundamental study of the communication problems, in which NASA also is involved." ■

CAPTAIN
Richard H. White

CAPTAIN
Wayne R. Kurth

3d Tactical Fighter Wing

■ On 8 February 1979 Captains White and Kurth, flying an F-4E, were number two on a Dissimilar Aircraft Combat Mission in which all events through the first engagement were normal. During the second engagement, Captain White started a full afterburner slice back into the fight when he saw the left engine fire light illuminate. He immediately called "knock it off," retarded the throttle to idle, started a climbing turn toward the base, and declared an emergency. The flight lead then joined with him and confirmed the fire. The aircraft was trailing smoke. The left engine was shut down and the master switch turned off at a point 20 miles from the base. The crew elected not to eject because all other aircraft systems were still responding normally. The fire began to diminish somewhat; however, 15 miles from base, the first of three explosions occurred. The first explosion gave no visible indications of damage other than the fuel gauge going to zero. Again the crew considered ejection, but since the right engine continued running and the fuel gauge began to cycle, they elected to continue their recovery. As a result of the explosion and cockpit indications, Captains White and Kurth suspected possible fuel venting or leakage. They decided not to make an approach end cable arrestment, thus eliminating an abrupt stop and the possibility of fuel in the aft section rushing forward and igniting. On 9 mile final, the second explosion occurred resulting in a large hole in the vertical stabilizer. The aircraft continued to respond normally, and based on observations provided by the chase crew, Captains White and Kurth again elected to continue their approach. They decided to fly a steep approach and maintain 200-220 knots while on final. At 1 mile on final, a third very mild explosion occurred with the only visible external sign being a small puff of smoke. Captain White landed the aircraft at 170 knots and deployed the drag chute. The drag chute failed, but because sufficient runway was available, the crew still elected not to take a cable. They stopped the aircraft on the runway and egressed from the right side. Fire fighting personnel extinguished the residual fire. The timely decisions of Captains White and Kurth, when faced with adverse and deteriorating conditions, allowed the recovery of a valuable aircraft and gave the investigators an oppotrunity to determine the cause of the fire. WELL DONE! ■

☆U.S. Government Printing Office 1980-683-214/3

STATES AIR FORCE

Well Done Award

resented for
nding airmanship
d professional
ormance during
zardous situation
and for a
cant contribution
to the
States Air Force
ident Prevention
Program.

CAPTAIN
James K. Christopher

FIRST LIEUTENANT
Edward F. Trimble

401st Tactical Fighter Wing

■ On 7 March 1979 Captain Christopher and Lieutenant Trimble were on a night flight from Aviano AB, Italy, to Torrejon AB, Spain, in an F-4D. Approximately 30 minutes after takeoff, while flying at FL290 in IFR conditions, the aircraft had double generator failure which was accompanied by rapid cabin depressurization. They initiated checklist procedures for the problem and began a descent to lower altitude since cabin pressurization was lost. The nearest suitable airfield was determined to be Pisa AB, Italy. Degraded radio contact was established with Milano Control; however, the center was unable to provide radar vectors. With the aircraft in IFR conditions at FL150 the crew proceeded toward Pisa using dead reckoning. Several attempts to get the generators back on the line failed. Once positive radio contact with Pisa GCA was established, Captain Christopher and Lieutenant Trimble confirmed that they were clear of mountainous terrain, and descended to 5,000 feet in accordance with GCA instructions. When they requested vectors to a precision approach, they were informed that they had positioned themselves on a perfect GCA downwind using dead reckoning. The aircraft began experiencing UHF transmitter problems and Captain Christopher had to acknowledge all GCA instructions through his IFF/SIF equipment. Weather at Pisa was a 1,000 ft ceiling, 1 mile visibility with rain and a wet runway. The recovery was further complicated by their having to make a maximum gross weight landing because all fuel had to be retained in the event of lost communications or missed approaches. After rolling out on GCA final, Captain Christopher made one more attempt to cycle the right generator. It came on the line and the bus tie closed. He immediately lowered the gear and flaps and made an uneventful landing. The electrical problem was faulty CSD's, a bad left generator and a bus tie malfunction. Captain Christopher's and Lieutenant Trimble's outstanding systems knowledge and superior navigational ability resulted in saving the aircraft under extremely demanding circumstances. WELL DONE! ■

A pilot lives by hi knowledge, skill, awarenes and integrity of hi ground support peopl

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

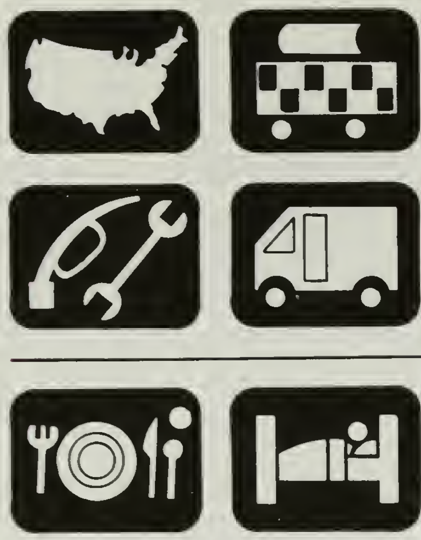
FEBRUARY 1980

WINGMEN DO IT BETTER—a close look at togetherness

MURPHY RIDES AGAIN—the notorious villain strikes

A HECTIC 24 HOURS—six shots at the barrier

A LITTLE ICE CAN GET YOU—cool it when you have ice



X-COUNTRY NOTES

MAJOR DAVID V. FROEHLICH
Directorate of Aerospace Safety

■ **WHO'S ELIGIBLE?** – We've had numerous inquiries about the Rex Riley list and who's eligible (in some cases vulnerable) for an evaluation. The current philosophy is based on *both* availability and quality of transient services.

AVAILABILITY is pretty easy – Currently bases must meet the following minimum criteria in order to be eligible for a Rex Riley evaluation:

- USAF, ANG or AFRES installation listed in the IFR Supplement as possessing facilities to serve transient aircraft and crews.
- Open (with transient services personnel) a minimum of five days per week and eight hours per day.
- Not be listed as OBO (Official Business Only status).
- Not be under a permanent PPR (Prior Permission Required status) with the intent of keeping transients out.
- Have no other continuing restrictions or shortages of facilities or services to transient aircraft or crews (i.e., no MD-3, MA-1A, LOX or similar commonly needed servicing items available).

Obviously several of these restrictions are very subjective! The key is *intent*! There are several bases which obviously discourage transients by PPR status, limited hours or published lengthy delays. Not to say that they are not justified in their policies or attitudes, 'cause they know their mission and capabilities better than we do. The intent of the Rex Riley program, however, is to recognize locations that a *variety* of transient aircrews can *easily* transit and obtain *good* service. (For info, we are carrying approximately 100-110 bases world-wide as eligibles with 57 currently on the list.)

QUALITY is the other biggee – Probably this is even more subjective, but it is also very common sense. In these days of shrinking budgets and UDL's, the good turn places are those that are experts at doing more with less. They make up the difference with desire. An airfield chief put it well – "You may have to park 'em in the boondocks, feed 'em C-rations and put 'em up in a tent. The key is meeting the crew, explaining why you have to inconvenience them and letting them know that that's the absolute best you can do. If you're trying your hardest, most crews will work with you."

That's the extreme, but the obvious answer is attitude. We've seen some folks in ancient facilities providing excellent service and some folks in brand new shiny buildings that didn't care two hoots!

We have a list of who we think is eligible, and there are roughly 100-110 bases world-wide that fall within the criteria. We try to monitor the IFR Supplement, NOTAMS, FLIP Area Planning an all the other airfield status documents. "There is only one of us," however, and once in awhile the status of a base will change. L us know!

REX ALMOST SPREAD-EAGLED – This last trip we lande at a SAC base and were informed that they had no inbound flight plan and we should hold our positi for identification. We sat, surround by security police folks, for a few moments until the airfield manage came out and checked ID cards. Point – we had filed properly and had a route of flight the whole leg but somehow the "inbound" had slipped through the crack. We did not call PTD while inbound to let them know we were coming! That call would have given the base op folks an extra 30 minutes to chec the system. Good reason for all transients to give dispatch a call inbound to warn them and protect yourself. All in the cause of bette service!

THANKS – We'd like to pass o our appreciation to some super professional crews and support personnel in the 1866, 1867 and 1868 Facility Checking Squadrons (AFCC). We negotiated an agreement for them to provide inputs to The Rex Riley files, and they have really grabbed the ball and run. We are getting useful an thorough comments on overseas installations and with these comments, are able to build up-to date and complete files on our out of-CONUS locations. Thanks for support! ■

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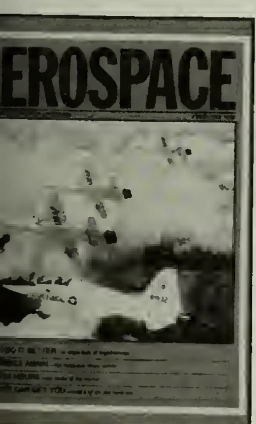

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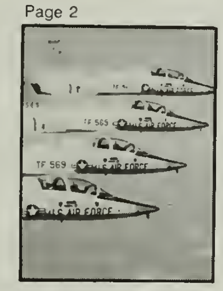

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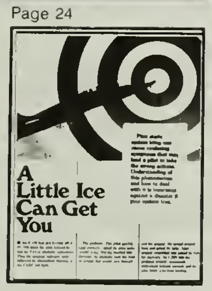


SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

The FORMATION CHALLENGE

MAJOR JAMES L. GILLESPIE, CF
Directorate of Aerospace Safety

■ The highlight of any airshow is a tight-knit aerial demonstration team flawlessly performing synchronized maneuvers. It never ceases to amaze how effortlessly they hold position, how gracefully they change formation, and how smoothly they guide their craft through a routine. To those of us who know better, we realize this doesn't just happen. It takes hours of dedicated practice for pilots already acknowledged to be the best at what they do, to perform in a consistent, safe and precise manner. The end result being a calibre of formation flying sufficient to instill pride in all of us.

The skill of formation flying is optimized in the aerial demonstration arena. The tactical necessity, however, can be found in the depths of air doctrine and strategy; thus, it goes unquestioned as to the need for military formation flying skills.

A good deal of time is devoted to mastering the basics during undergraduate pilot training. The fundamentals are further honed during operational training. Although the multimotors fly formation in their own inimitable fashion, it is the fighter pilots who capture the imagination. The mark of a fighter jock, once his bomb scores and air-to-air capabilities have been established during "happy hour," is how well he can lead a four-ship in an aerial engagement or how he can stick on the wing through maneuvers not yet invented. With such a well established criterion, is it any wonder that an embryo fighter pilot one day will find himself in a situation where he runs out of ability and ideas at the same time?

In 1978, operator factor forma mishaps cost the United States A Force five aircraft destroyed, fou fatalities and approximately $24. million. To the end of 1979, the cost was nine aircraft destroyed, seven fatalities, and $56.0 millio An increase in all three categorie but, more dramatically, in dollar value. As the cost of weapon systems increases, the dollar val loss will rise in proportion. In th case, two F-15s and two F-111s created an impact for 1979 (no p intended). The point here is that operational formation flying carr an inherent risk in terms of lost resources, financial as well as human.

Pilots must be fully trained an proficient when participating in formation operations. An error i judgment or momentary lapse in

continued on p

WINGMEN DO IT BETTER

.T COL HORST GAEDE, GAF
)irectorate of Aerospace Safety

■ How would you like your next light as a wingman being evaluated ike this?

– The wingman realized the flight vas being conducted in an illegal ınd unsafe manner, but chose not to nake a direct comment to the eader, or

– Although aware that the flight ıad been continued to below the ninimum altitude, the mishap crew elected to follow number 1 through ıis last ditch, split S type maneuver.

These two cases ended up in smoking holes with more than just embarrassment on the wingman's part. They caused loss of life and ıircraft and should give us some serious thought.

Talking about flight and formation tactics, policies and individual responsibilities, the picture has changed over the years. During World War II, e.g., German fighter aces used to select and fly with the same wingman day after day (or as long as he survived). The wingmen were nicknamed "KACZMAREK" (which sounds awfully Polish), and their main and only objective was to clear the leader's 6 o'clock when he was out adding more and more kills to his account. They usually did not engage in the "shootout" unless circumstances dictated or the leader ran out of ammo. Because of their very specific task and responsibility, they had to stand back behind their leaders; their names were hardly ever known.

Today, we work things differently. Going out to perform and to train for the "real life," we share almost equal responsibilities, play the "Engaged and Free Fighters" game, stress mutual support, work as a team!

Still, we designate flight leads (we even call them that), but wingmen are more "grown up," with equal rights and opportunities! With more responsibilities, too?

We expect the flight leader to know and consider the capabilities of his wingman or -men and hold him responsible for:

– Flight integrity and air discipline.

– Directing radio communications.

– Navigation.

– Keeping the flight clear of other aircraft and objects.

– Planning and performing all maneuvers without exceeding either

continued on page 4

The FORMATION CHALLENGE continued from page 2

concentration can be crucial. The 19 formation mishaps reported during the period break down are: Nine airborne collisions (eight involved wingmen hitting lead); one collision with lead during the takeoff roll; two cases of the pilot losing aircraft control immediately after takeoff; three instances of lost wingman (two of these became disoriented and crashed: the other hit another member of the same formation in cloud); one departed flight during attempted rejoin; two flew into the ground, one struck a grain elevator. Also there was one case of vertigo where the wingman broke out of formation and recovered single ship. Surprisingly, formation rejoins contributed to only three occurrences of wingman hitting lead.

The greatest potential for mishap exists while flying in close formation. Add to this a bad weather penetration, whether a departure or recovery, and the plot thickens. Close formation flying is an exercise in discipline. The formation leader, being the eyes and the brains, is responsible for maneuvering in such a manner that the weakest member can hack the mission. At all times he must be aware of problems his wingmen may be battling, whether it be turbulence, vertigo, or both. A thinking man's formation leader who anticipates every eventuality, can greatly reduce the associated risks.

The wingmen have no less responsibility for the safety and integrity of the formation. If the leader maneuvers aggressively, is rough or is making it unnecessarily difficult for his wingman, he sho be told. Confusion within the formation must not be allowed tc exist. The absolute cooperation c each member is imperative for mission accomplishment.

Periodic in-depth personal revi of formation fundamentals are necessary to avoid airborne embarrassment. False pride can l the single most significant factor leading to a formation mishap. Ir this demanding environment, performance is all important. Generally, you are the best judge your strengths and weaknesses. Introspection can be a worthwhil exercise. ■

WINGMEN DO IT BETTER continued from page 3

aircraft limitations or aircrew capabilities.

Our concept of the wingman's task and responsibility include such things as consideration of others in the formation and capability to react to any circumstances precisely and surely. We charge him with responsibility for:

– Performing within briefed or otherwise defined parameters.

– Maintaining flight discipline and integrity, unless emergency conditions are encountered, or in the interest of flying safety.

Last, but not least, we expect all wingmen in a formation to feel responsible for the safe conduct of the mission and to

– Bring to the attention of flight leads any unsafe condition or violation of flight regulations.

In other words: When you are out there, Blue 2, don't just hang in there, keeping communication to an absolute ZERO. Don't close your eyes, no matter how great your respect for lead's ability and judgment might be. The old saying, "What you don't see, won't hurt you," is not true in aviation.

If you see something wrong, SPEAK UP! If you don't speak up when you observe an unsafe condition, at best it could be embarrassing and at worst, it co be fatal.

And, if this still doesn't trigge you, try to think of it this way: aircraft might be replaced, a frie might be gone forever! ■

MURPHY...

Rides Again

AJOR ROGER L. JACKS
rectorate of Aerospace Safety

■ Occasionally, crew coordination is put to a hard test when Murphy's Law is lurking in the shadows. This is the story of a B-52 crew that was having one of those unforgettable days.

It started at base operations while the crew was filing its paperwork. The copilot looked toward the door and then quickly back to the crew. "I think we're in for a long day; we've got company coming guys!" As the other crewmembers turned around to look, they saw two men wearing white scarfs coming through the door.

"Great!, just great!", remarked the nav; "just what we need, a no-notice standboard!" Suspicions were quickly confirmed as the two men made their way to the crew and informed the aircraft commander that the pilot and nav teams were being given a no-notice standboard.

Silence fell over the group, and anxiety levels were rising when the copilot quipped, "You guys have the wrong crew. Rumor control has it you're getting on with E-04 in a couple of hours."

"Sorry about that. I guess today's your lucky day," retorted the stan eval pilot.

"Yeah, we're really lucky," grumbled the radar nav.

The aircraft commander was lost in his own thoughts: "We've got a sharp crew; the mission is straightforward; it shouldn't be a problem if only . . . if only something unforeseen doesn't screw us up."

The first part of the mission was smooth. The takeoff, departure, air refueling and navigation events were flawless. Activities aboard the B-52 were at a quick pace as the crew prepared for their descent into low level. The pilot and copilot were getting weather updates, entry

MURPHY...

continued

clearances, and digging the low level map out of the mound of pre-mission paperwork. The electronic warfare officer was busily stowing the sextant and had offered a cup of coffee to those so inclined. The nav team was copying low level weather data, working the low level entry point timing problem and rechecking the bombing and navigation data displays. The gunner was reviewing bomb run timing charts and checking the operation of his stop watch.

The weather report indicated it was going to be a rough and rocky road to the simulated bombing targets. Clouds, turbulence, and rain had all been forecast. The pilot, gazing down toward the low level route, informed the crew that it did, in fact, look "pretty grim." As the pilot eased the big airplane into a shallow descent, the radar nav took one last gulp of coffee and started looking for navigation points on his radar scope. The crew was all business; aircrew tasks were foremost in everyone's mind.

As the B-52 descended into the low lying clouds, the aircraft began to be battered by the turbulent air. The navigator was busily scanning his data display panels. A quick plot of the aircraft's position on his low level chart, confirmed by a cross check using the radar scope, told him things were going well. His eyes continued to dart from object to object gathering information. Suddenly, he felt a queasy feeling manifesting itself in his stomach. The crew compartment that encapsulated the navs had become a churning sea of motion. The navigator searched for something to focus his eyes on that wasn't jiggling hoping to avoid the grand finale to air sickness.

In the meantime, the evaluator was getting cramped on his makeshift seat between the two navigators. With a lull in the turbulence, the evaluator took advantage of the calm air and stood up to stretch his legs. He had leaned against the crew ladder providing entry to the upper deck, when suddenly he felt searing pain spreading down his back. He cla[w]... at the clothes on his back as the radar navigator announced to the crew that they were initial point inbound. The bomb run had begu[n]...

Out of the corner of his eye, th[e]... radar nav saw a sight he couldn't believe. The evaluator with pain [on]... his face was shedding his clothes with reckless abandon. The radar nav was mentally trapped betwee[n]... the evaluator's crisis and the bom[b]... run. To add to the confusion, the turbulence intensified, and the navigator began turning different

nades of green. In a shaky, istressing voice, he asked the radar av, "Have you eaten the potato hips out of your lunch yet?"

"You've got to be kidding," eplied the radar nav, "We're on the omb run and you want to know my ating habits?"

"Have you?", demanded the auseated nav.

"Yeah! Now check my cross hair lacement," yelled the radar nav.

"Can I have the potato chip bag, idar, I think I'm going to be sick," aid the nav.

Handing the nav the crumbled ag, the radar nav selected his first ffset aiming point and let out with n, "Oh, no!"

The pilot, fearing the worst, sked, "What's going on down ere?"

The radar nav replied, "The lousy ffset is in backwards. Nav, get the ght offset in. Pilot, hold this eading unless you've positively lentified the target area."

"I've got the target in sight, idar, I'm going to ease us a little it to the left," said the pilot.

"My timing shows 90 seconds to elease, radar," yells the copilot.

"That checks with the gunner's ming, radar."

"How's the offset coming, nav?", asked the radar, trying not to inflict his voice with panic.

"I've about got it," reports the nav. "Boy! I'm in bad shape."

"Thirty seconds, radar," warns the copilot.

"O.K., pilot, I'm on the offset, in the bombing mode and the steering indicator is good," states the radar nav.

"Roger, radar, coming 3 degrees right," adds the pilot.

"O.K., guys, the nav is feeling bad, help me with the timing run."

"Roger, radar, got you covered," says the copilot.

"Gunner's ready, radar." A few seconds later the radar announces simulated bombs away.

The pilot turns the giant aircraft precisely to the radar nav's desired heading, and copilot, gunner and radar nav recheck the time to the second simulated bombs away. Seconds later, the bomb run is over, and the pilot starts a climb out of the low level route.

As the radar turned to see how the evaluator was making out, he saw a guy standing behind him wearing only jockey shorts and flight boots. The tension that had built up in the radar nav was shattered with his laughter as he gazed upon the pitiful looking evaluator.

"What happened back there," he quipped.

"Some SOB forgot to lock the push button dispenser on the coffee pot. Something or someone hit the button and hot coffee poured down my back," replied the evaluator. "Take a look, I think I've got blisters."

"Just a second," said the radar. "Nav, how are you feeling?"

"O.K., now that the damn turbulence has let up. Why does everything always happen at the worst time?"

"I don't know, nav, but it does. If you're all set, take the navigation and I'll see if I can help the evaluator take care of his burns."

As the radar assisted the evaluator, the navigator paused a second and thought about how lucky he was to be on a crew with a group of hard workers – professionals that backed each other. He had learned a lot about crew coordination, but little did he realize he would have the opportunity to demonstrate the same skills an hour later.

"Demon 22, this is Oakland Center, descend and maintain one six thousand."

"Roger, Oakland Center, Demon 22 is out of FL 250." The pilot had begun the descent when the copilot asked, "What altitude did he say?" The pilot responded with, "He said we're cleared to six thousand." The copilot gave a nod of understanding.

"Pilot," said the nav, "How about checking that altitude. I'm pretty sure he said one six thousand."

"O.K., nav, copilot, give Center a call and check it out."

Crew coordination – it can protect your career and it can save your life. ■

Birds Of A Feather

Bird strikes are routine—several are reported nearly every day. Once in a great while, though, one really gets your attention. Here is such a one. It meets all the requirements of a hairy tale and provides a good learning experience. Also, we commend the crew for their great handling of a difficult situation.

■ An F-4E was on a low level navigational training flight at 2,50 feet AGL, 6,200 MSL, 450 KCAS when the pilot saw a large bird (estimated wing span 6 feet) in fro of the aircraft. He made an immediate pull and roll but was unable to miss the bird. The left external tank departed the aircraft impact. Investigation revealed that when the armament wire bundle w severed, jettison voltage was provided to the wing tank. A straight ahead climb was initiated and airspeed was reduced to 300 KCAS. A check of the engine instruments showed that the left EGT was at 800 degrees C and tha the left rpm was at 70 percent. Th left throttle was then retarded to id and all engine instruments indicate normal. The pilot also lost intercor and UHF radio communications.

At this point, the WSO took control of the aircraft to assure tha it was climbing to a safe altitude.

The WSO initiated a call to the vingman and instructed him to ejoin to assess damage. Control of he aircraft was returned to the pilot fter ascertaining he was okay by ısing handsignals. Throughout the emainder of the flight, the pilot assed notes to the WSO relaying ircraft status and other vital nformation. The WSO relayed irective information to the vingman as the flight proceeded ack to base.

Approximately 45 NM from base, ie left engine oil pressure decreased apidly from 25 PSI to 15 PSI. The ngine was shut down to avoid urther damage, and a note was assed to the WSO explaining this ction. During the descent the pilot egained intercom and UHF ommunications. At 25 NM from ie field the utility hydraulic ressure began to fluctuate down to ,000 PSI while in straight and level ight. It was decided to start the left engine on final due to possible loss of utility hydraulic pressure. On extended final, the left engine was started, and engine instruments remained within limits for the remainder of the flight.

When the landing gear were lowered on a 10 mile final, the right main gear indicated ''barber pole'' in both cockpits. A missed approach was accomplished, and the emergency gear lowering checklist was followed; however, the right main gear continued to indicate barber pole in both cockpits. Because the right main gear appeared to be down and because other electrical problems had been encountered, a wheels down, approach end, BAK-12 arrestment was decided upon. The flight terminated in an uneventful BAK-12 approach end arrestment.

The crew demonstrated outstanding crew coordination in handling the emergency during the communications failure. Good crew coordination between front and back seat has saved several aircraft.

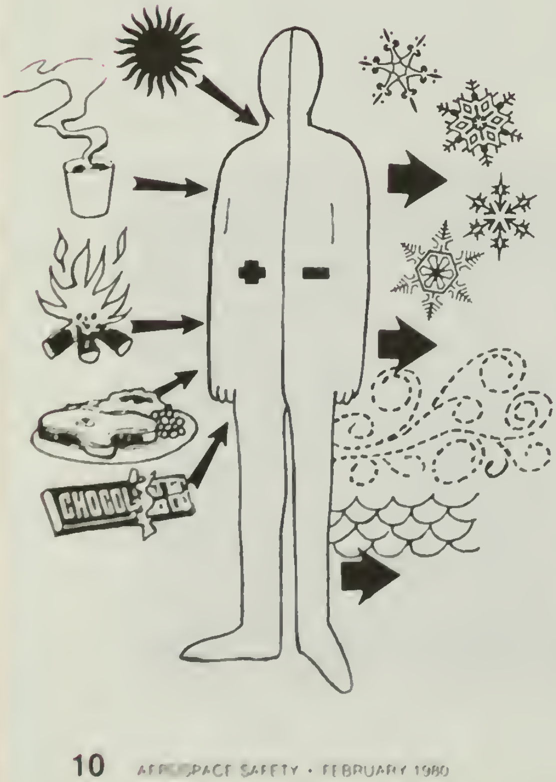
That was the case in a bird strike last October that partially disabled the front seat pilot of another F-4. At 480 knots and 500 feet AGL the aircraft struck a buzzard. The bird hit the right quarter panel and slammed into the cockpit, breaking the pilot's arm, shattering his visor and damaging the right side of the parachute housing container. The IP in the back seat took over and made the landing.

Crews flying dual seated aircraft can prepare for such emergencies by thoroughly briefing for them, particularly for low level flights and during bird migration seasons. ■

Destructive force of a birdstrike is illustrated by photos on page 8 and below. Strike occurred at 2,500 ft AGL at 450 KCAS.

Hypothermia

LT COL GEORGE J. BIFOLCHI • Directorate of Aerospace Safety



■ *Weather conditions: Ceiling obscured, visibility one-half mile in ice fog, wind calm, temperature minus 50 degrees Fahrenheit. The cargo compartment of the tanker was unheated because the auxiliary power unit wasn't operating. For two hours the heavily clad pilots, navigator and boom operator struggled to keep warm in cockpit temperatures nearly as cold as outside. As the last of four spare aircraft providing air refueling support for an airborne reconnaissance mission, the crew did not expect to launch. Then the unexpected occurred . . . the crew completed their final checks, advanced power and released brakes. The heavy aircraft lumbered down the runway and slowly rotated into the black arctic night. A few minutes later the crew reported having a problem raising the gear. Thirty seconds passed . . . radio and radar contact were lost . . . and a huge fireball lit up the sky.*

Most of us relate cold injuries with "exposure" to the elements; however, we usually expect sufficient warning to eliminate the problem before becoming incapacitated. Yet even knowledge of cold weather hazards with adequate warning is not enough if we fail to apply good judgment in a timely manner.

A significant factor in this accident was the overwhelming distraction caused by chilled extremities. Also suspected was a subtle but pernicious hypothermia resulting from a lowering of the body's inner core temperature through a loss of heat. In extreme cases the loss of heat can result in uncontrollal shivering, increasing clumsin and loss of judgment followed rapi by unconsciousness and death.

Hypothermia has a well doc mented history. Although relativ rare as a threat to the flier, it c stitutes a high risk for a traveler mountainous terrain or a cold weat crash survivor. During World V II, it was a routine threat to wa gunners aboard unpressuriz bombers flying at altitudes abo 25,000 feet. Hypothermia has me death to scores of mountain climb suddenly beset by unplanned conditions . . . it's known as a kil of the unprepared.

The body maintains thermal eq librium by regulating the producti and loss of heat. Body heat is p duced through eating and muscu activity while external sources heat, such as the sun, a campf or warm liquids, also contribute. T most immediate benefits of increas heat are realized through wa liquids or sweet foods that are quic transformed into heat energy. Hea physical heat production up to times the exertion can increase bo basal metabolic rate, while heat p duction drops to 80 percent of basal rate when sleeping. Inter shivering produces heat equivale to running at a slow pace (six tim the basal rate). Body hormones c also produce heat when adrenalin increased or when body illness produce fever.

Heat loss occurs through the m chanics of cooling, respiration, rac ation, evaporation, conduction a convection. Not much can be do to decrease heat loss through respir

cold weather killer

ion—inhalation of cool air and xhalation of warm air. Radiation, n the other hand, is a leading cause f heat loss through an uncovered or nprotected head. At 5 degrees Fahenheit, radiation can account for the oss of up to 75 percent of the total ody heat produced. Evaporation osses occur through sweating; howver, this process should be assisted y wearing loose fitting fabrics that breathe" but still retain body heat. onduction occurs when the skin ansfers heat through contact with etal or stone surfaces. Convection eat losses occur when the warm air yers next to the body are removed y a brisk wind.

Two elements accelerate the loss f body heat: wind and water. Windnill is a product of temperature and ind velocity. The chill factor at 40 egrees F with a wind blowing at 25 iles an hour is 15°, generally condered "very cold." At 0°F the same ind will produce a chill factor equal −45 degrees. Water conducts heat 40 times faster than air. When clothg gets wet it no longer insulates by apping warm air next to the body, it instead, rapidly dissipates the eat into the atmosphere. Experients have shown that wet clothing tains only 10 percent of the heat tained by dry clothing. Moreover, cold wing blowing against wet othing can cause "waterchill" hich will dissipate heat much icker than the body can produce it.

Maintaining the body's thermal uilibrium seems simply a matter balancing "calories lost" with calories gained"; however, body eat loss through cooling is often mpounded by heat loss through physical exertion. The thermal balance in cold wet conditions is maintained by a combination of shivering and increased work rate. In severe cold stress, the metabolic demand may be so great that only an individual in top condition can meet it over a sustained period.

The body's initial response to cold is constriction of the blood vessels of the skin and tissue beneath. This action decreases the amount of heat transported to the skin with a resulting decrease in the temperature of the skin. The skin and surface tissues then act as insulation for the body core which maintains a constant temperature of 99 degrees Fahrenheit.

As skin temperature drops, sense of touch and pain decrease, the muscles and their motor nerves are weakened. Shivering produces heat, but it also consumes energy and, if it is intense and prolonged, can result in exhaustion. Continued heat loss produces violent and uncontrollable shivering, difficulty in speaking, sluggish thinking and amnesia. Advanced heat loss results in muscular rigidity, erratic heartbeat and labored breathing, unconsciousness and, finally, death. Simple maintenance of heat equilibrium can become extremely difficult in a survival situation where a lack of resources, physical injury, or poor planning have rapid and disastrous consequences.

Field treatment for hypothermia involves two aspects: Preventing further body heat loss and increasing the existing level of heat. Several actions are essential:

- Obtain shelter from wind and rain.
- Remove wet clothing and replace with dry clothing.
- Insulate the victim from cold or dampness.
- Add heat by any method available.

Shivering is a good sign that the victim is able to provide self-warmth. When shivering stops, the individual is no longer able to warm himself and must be assisted by others.

A cold sleeping bag, regardless of rating, will not provide sufficient warmth to treat hypothermia. The sleeping bag should be prewarmed by another individual who has stripped down to his under garments in order to transfer maximum heat from his body to the bag. Conscious victims of hypothermia should be given warm fluids or sweetened foods which are most quickly converted to heat.

To prevent hypothermia you must plan for the unexpected, be alert to the causes and know how to treat it effectively. Your choice of survival clothes may well be limited to those you wear in flight. Will they keep you warm and protect you from the rain? Do you carry food in your flight suit for quick energy and heat? Injuries will affect your efforts to keep warm; therefore, avoid situations which lead to uncontrolled heat loss. Minimize the effects of wind and rain. Conserve your energy; exhaustion can produce a loss of heat as great as that caused by wet clothing. Be familiar with the symptoms of hypothermia and probable sources of heat loss . . . and remember hypothermia can subtly become a cold weather killer. ■

SPATIA

MAJOR KENNETH C. DOZIER, MC, F

■ "Flying by the seat of your pants" can fly you right into a smoking hole, for things aren't always as they seem to be. Spatial disorientation, or pilot's vertigo has claimed, on the average, six aircrews per year for over 20 years, and with our newer, faster, and more demanding aircraft, the numbers aren't likely to improve unless each of us prepares to compensate for spatial disorientation.

Spatial disorientation is a false perception of your position in relation to the earth's surface. Even the most experienced pilots are subject to spatial disorientation, because in flight you cannot depend on your usually reliable senses. On earth your sense of balance and orientation comes from visual, touch, and inner ear centers. However, G-forces, weather, pressure changes, and the high speeds encountered in flight can confuse you. The only reliable sense you have in flight is visual. The old adage of "Believe your instruments," is absolutely true!

How many of you have experienced one of the following:

I was flying straight and level, but I felt as if one wing was down.

I was sure I was flying straight and level, but I was actually in a turn.

My copilot said that on several occasions after leveling off from a bank, I over-banked in the opposite direction.

While on instruments, I found myself leaning to the right in order to feel as if I were sitting upright.

When I flew out of "the soup," the horizon seemed severly tilted, but my instruments said I was straight and level.

I was flying on a dark, star-filled night down the coast, when all of a sudden, I couldn't distinguish the position of the horizon, or the difference between stars and surface lights.

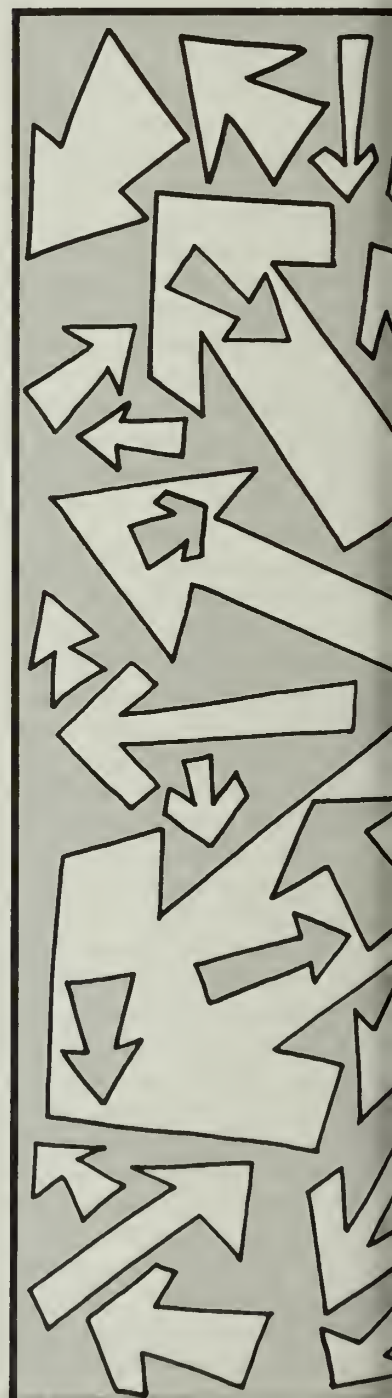
We were flying in fog, and I became confused by the flickering of the rotating beacon.

I was flying in and out of the clouds, going from VFR to IFR and I really got disoriented.

After a rapid climbout to 20,000 feet, I felt as if I were isolated and separated from earth.

We were about three hours out from the coast on a routine flight, when I had the strangest sensation that I was going in the wrong direction, and I even considered turning around.

These comments weren't from "The Twilight Zone." They were made by experienced pilots who suffered some form of spatial disorientation. It is not difficult to imagine that any of these false perceptions could result in disaster. To clarify,



DISORIENTATION

SAF Hospital Beale • Beale AFB, CA

the following are some of the most likely situations to produce spatial disorientation:

The transfer from VFR to IFR.

Fixing on isolated light sources during night flight.

Prolonged high altitude flight in which a false horizon is likely to be perceived.

Prolonged acceleration or deceleration in line of flight.

Prolonged turns.

Sub threshold changes in altitude.

Formation flying.

Poorly lighted and positioned instrument panels.

Rapid head movements.

Inadequate IFR training and experience.

Flying with upper respiratory infection.

Alcohol and/or drugs.

Fatigue.

It is mandatory that you believe your instruments. You should not unnecessarily mix VFR and IFR, but you should make an early transition to IFR in poor visibility. Furthermore, you should review in your mind how to compensate for spatial disorientation. If you suddenly find yourself disoriented, go to your instruments immediately. Then check and cross check your instruments. Stay on your instruments until external visual references are absolutely clear. Again, do not make repeated transitions from VFR to IFR. Maintain a correct instrument scan, and do not omit altimeter checks.

Prior to performing acrobatics maneuvers, review spatial disorientation correction procedures. Finally, if orientation cannot be regained, abandon the aircraft.

If you are still of the opinion, "It couldn't happen to me," may I make a suggestion. See your physiological training officer and ask for a flight in the Vertigon. The Vertigon is a simulator designed to produce spatial disorientation and score your ability to compensate. It is the opinion of some researchers that the ability to compensate for spatial disorientation can be improved by practice in such simulators as the Vertigon. It is well documented that improved scores appear with repeated Vertigon flights. Hopefully, the improved ability to compensate for spatial disorientation can be transferred from the Vertigon to the cockpit.

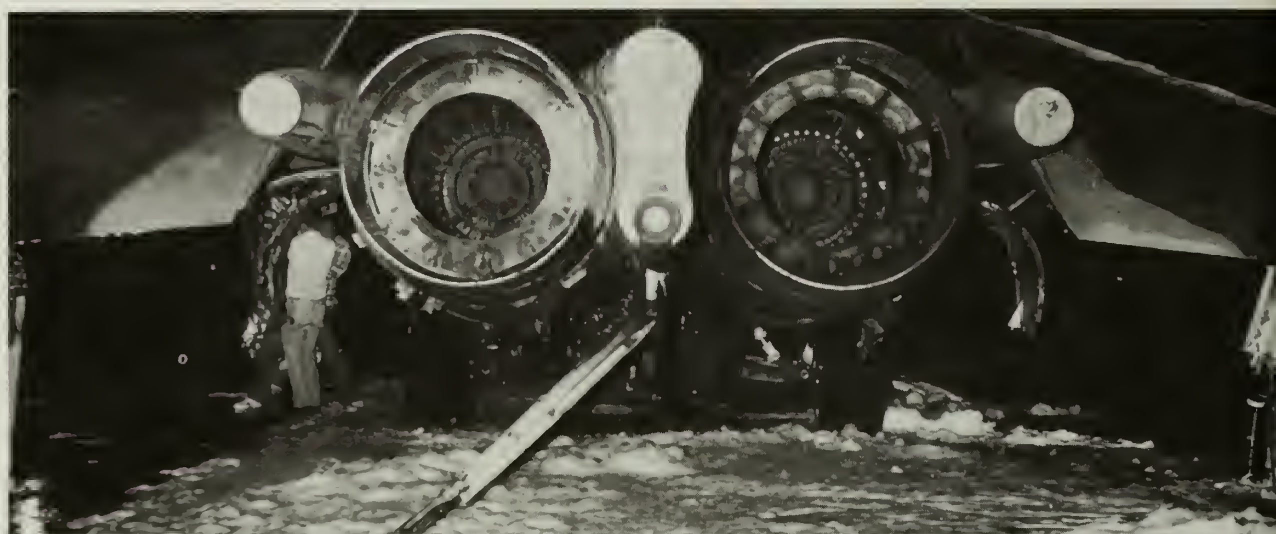
In conclusion, spatial disorientation is a normal reaction to unreliable sensory inputs. Even the most experienced pilot can be affected. The oldest and best advice around is still "Believe your instruments." ■

REFERENCES

1. *Bonifile, Hubert F. and Yunes, Earl L.*, Flight Surgeon's Check List, *1979, page 56.*
2. *Clark, B., "Pilot Reports of Spatial Disorientation across Fourteen Years of Flight,"* Aerospace Medicine, 1971 *42, 708-712.*
3. U.S. Naval Flight Surgeon's Manual, *1978, page (3-1)-(3-44).*

A special thanks to: Major Mike Blanchard, Norton AFB, CA and Captain Cliff Cunningham, Beale AFB, CA.

A HECTIC 24



Seldom has an Air Force base d so much activity, with a tential for catastrophe, in a 24-ur period than Cannon AFB, NM. e 24 hours included seven barrier estments, one of which was a rning F-111D, and three blown es. Members of the 27th Civil gineering Squadron had a real test their readiness, with barrier intenance personnel, pavements l grounds troops, and firefighters having a part.

At 1930, 20 September, the ion-packed 24 hours began. A nsient T-38 blew a tire on ding, skidded and caught the parture end barrier cable with the which was then burning. The was quickly extinguished by efighters, but the main runway s closed. This left the secondary way with both its barriers erational, one of which had just n repaired and put back in eration. At 2030, after moving the 8 from the main runway, (still sed because of FOD) the call ne that an F-111D was returning m the bombing range with an ine fire. The aircrew asked for approach end barrier arrestment runway 12 of the secondary way, 12-30.

The fire trucks were at the T-38 ergency and had no time to pre-ition for the F-111, which ked the arresting cable and pped at a taxiway intersection ere a P-2 and O-11A were itioned.

The crew egressed while the ks immediately began foaming fire, which did not go out immediately but continued to burn, completely engulfing the rear half of the aircraft. By this time, the P-2 and O-11A were joined by the P-4 and F-7 runway foamer which began resupply to the O-11A and P-2.

At that point it was evident that fuel was feeding the flames, so Mr. Jesse Ford and Mr. Frank Martz, covered closely by two other firefighters with foaming handlines, entered the blazing area to shut off the valves in the wheelwells. After approximately six minutes the fire was extinguished. Firefighting agent had been emptied from all fire trucks except the P-2. The second foamer was en route from the station manned by off-duty firefighters and the other equipment had begun to reservice.

The pavement under the cable was inspected by the base engineer later that evening and found to have scarred the pavement in the exact spot which had been smoothed by the pavements maintenance folks after an earlier engagement.

The 24-hour saga continued as barrier maintenance troops began to replace the barrier tapes and cable even before crash recovery had defueled the aircraft and completed its movement from the runway. The change out was completed at 1400, 21 September, just as rain began and the Friday afternoon Navy transients began their descent on Cannon.

First, a Navy A-7 blew a tire on the main runway, closing it because of FOD potential. The barrier that caught the burning F-111 the night before had just been put back in service after tapes and cable change when the need to use the secondary runway arose.

The second Navy A-7 took the approach end barrier on runway 12. It was reset quickly by the firefighters in time to catch the third Navy A-7 in the same barrier.

The fourth A-7 landed at the opposite end of the secondary runway, 30, blew a tire, spun 180 degrees but remained on the runway. He was towed to a taxiway barely off the runway when A-7 nr five took the approach end barrier on 30.

All this took place in less than an hour while the primary runway was still closed. The A-7 was removed from the runway and the barrier reset just in time to catch an F-111D approach end engagement at the 30 end.

The main runway was opened and the 24-hour period wound down with the recovery of 14 F-14s, all routine landings.

People, vehicles and equipment out of many shops displayed their capabilities well by working together at their maximum effectiveness. The highly trained and motivated troops performed in the professional manner that aircrews depend on and take for granted. The Civil Engineering folks showed how they are part of "Readiness is our Profession" and "Fly and Fight." ■

HOURS

LT COL CURTIS O. ZEIGLER • Cannon AFB, NM

I Learnt Ab

■ Once upon a time I was on exchange in the United States flying Phantoms. My squadron was tasked to fly four aircraft across the Atlantic to the Azores. We were to position the aircraft as en route spares for our sister squadron which was due to take part in a major NATO exercise in the Mediterranean. The plan was for us to fly from the East Coast to overhead the Bermuda TACAN, meet up with our tankers east of the Bermudas and then fly unaccompanied the remaining 1,500 miles to Lajes.

I should have realized something was fishy when our "hours hogging" squadron boss opted out with the feeble excuse that he "Couldn't afford the time away" or something, and gave me the lead—despite the chance of a two week "swan" around the Med while we waited to fly the spares home again.

At this point a look at the flight plan was in order. Having done so, the reason for the rather abrupt and slightly mysterious phone call from HQ, which I received earlier, asking what we normally used as a landing fuel reserve suddenly became clear. On the "deck" with 2,000 lb at the Azores was the best we could do and that assumed no headwind, no fuel venting, no transfer problems, and no "cold" engines. Being a veteran of the Leuchars to Tengah Lightning run this fuel margin didn't impress me one little bit, especially as navigation for the majority of the unaccompanied 1,500 miles would be by the nav's DR and you know how unreliable that can be! To add to our problems the Doppler update to the nav computer had been removed so any unforecast wind would be undetected until too late, the radio compass was notoriously unreliable—almost useless in fact—and Lajes had no DF facility. We would be relying almost completely on TACAN at the other end and an unplanned 30 knot crosswind would put us outside TACAN range. After much complaining, we did manage to get the refueling bracket moved a little farther east, but this still gave us, at best, a planned 3,000 lb overhead. Anyway the order was to GO.

Our reserve aircraft were the last to take off. The diversion of 6 out of the 12 previous aircraft into Bermuda should have given someone the clue that the fuel plan was inadequate. But although at this point the whole exercise was looking rather "dodgy," to say t[h]
least, we did feel a certain obligation to "press on" if at all possible.

For some reason my Nr 4 was nearly 1,000 lb down on the rest [of] the formation when we rendezvoused with the tankers. T[hey] had agreed to come 100 miles cl[oser] to avoid a "chicken fuel" diversi[on] into Bermuda. However, having plugged in, Nr 4 filled up in one and then had to remain in contact for the rest of the now extended bracket. At 210 knots with three drop tanks, reheat was required t[o] stay in contact for much of the ti[me] and a few eyebrows were raised back at base when it was discove[red] that he had taken a total of 24,00[0] lb. After all, at maximum fuel

ing From That

**A Royal Air
orce pilot tells
f his
xperience and
ome of the
itfalls that may
wait aircrews
ver the Mid-
tlantic.**

ght a Phantom holds only 22,000
The tankers had to cut into their
n fuel reserves to leave us full at
dropoff point— I learnt some
re about tanking from that!
'he unaccompanied leg started off
sonably uneventfully, except that
ow became apparent that Nr 4's
plane was actually using more
l than the rest and it wasn't just a
rottle pumping'' problem. I
culated he would be overhead
es with 2,000 lb. The weather
ecast was still good and the
kers informed us we had a 20
t tailwind during the refueling—
we pressed on. We passed the
o-return'' point with little change
he situation, then the clouds
an to appear and got thicker—
thicker— until we were all in
se formation with 400 miles still
to go.

There was an emergency tanker available 200 miles due west of Lajes. The chances of finding it were not good as he was in thick cloud at the time and Nr 4 could not afford the fuel to make an attempt. We attempted to get an Air-to-Air TACAN and radio compass fix on him. However, not one aircraft in the formation could achieve a TACAN lock-on and the radio compasses gave a very weak return, which showed we were well to the south of track when abeam his position. With a dry mouth I called the formation to turn 30° to port. The next 15 minutes were the longest of my life. Nr 3 got the first angle lock on Lajes TACAN, which to our relief came up just to the left of our nose, and a few minutes later he also achieved a range lock at 85 miles.

However, our troubles were far from over. Lajes still refused to talk to us even though we could hear them loud and clear. We were still in thick cloud at altitude and apart from the forecast, in which we no longer had much faith, we had no idea what to expect down below. By this time the Nr 2 had lost his main gyro and had no TACAN, Nr 4 was getting very short on fuel and my ASI failed in the descent. We recovered in pairs on modified TACAN descents avoiding a 2,000 ft hill 2 miles to the north of Lajes, and broke cloud over the sea at 800 ft. Nr 4 landed with 700 lb of fuel remaining.

I learnt a lot from that trip, but four lessons stand out in my mind. First, planning to have low fuel reserves is not too bad in itself but when the chances of getting lost are good, the "pucker factor" is bound to increase if there is the slightest miscalculation. Second, long overwater flights have to be meticulously planned and the presence of a tanker— at any stage— must not trap one into a false sense of security. Third, if tankers are not available to accompany the fighters, then whenever possible an INS equipped aircraft should be included in the formation. And finally, an air traffic controller from one's own service pre-positioned at the destination airfield can do much to ensure the aircraft's safe arrival.

Next month I will tell you about the flight home.— Courtesy *Air Clues,* October 1979. ■

Helicopter In-Flight Icing

From an article by Arthur J. Negrette, 129th Aerospace Rescue and Recovery Squadron, California ANG, which originally appeared in *Aerospace Safety*, March 1977. The information is still current and valid.

The inherent limitations of helicopters and their susceptibility to icing hazards require a more comprehensive understanding of in-flight icing conditions and their relationship to helicopter operations.

■ A major finding of artificial and natural icing tests conducted by the Army in 1974 was that moderate ice accumulation (about one-half inch) on inboard portions of the UH-1H rotor blade — and similar aircraft — was sufficient to prevent a safe autorotation in the event of an engine failure.

This abnormality results from ice accumulation in greater amounts near the inner portions of the rotor disc, which directly affects the blade's efficiency with respect to upward airflows during autorotation. The reported result is that, with about one-half inch of ice on the main rotor blade's inner portion, minimum (safe) rotor rpm cannot be maintained during autorotation.

Helicopter pilots should not judge or estimate main rotor blade ice accumulation by observed buildup on the windshield or other parts of the aircraft, since icing occurs at an accelerated rate on the rotor blade as compared to accumulation on the fuselage. A more reliable method for operators of UH-1 aircraft is to estimate ice buildup on the main rotor blades by monitoring power required (torque indications). Researchers indicate that blade icing of one-half inch or greater will be accompanied by a 5- to 6-psi torque increase over the before or "no ice" power requirement.

This phenomenon does not appear to be unique to the UH-1 and deserves the attention and consideration of all helicopter operators.

Many helicopter pilots are inclined to disregard the potential hazards of main rotor blade icing owing to the in-flight "shedding" of ice. In-flight shedding can and does occur. Unfortunately, it is as likely to create a problem as it is to relieve one.

Symmetrical (affecting all rotor blades simultaneously in the same way) shedding in flight can be beneficial by restoring the rotor blades to a more efficient or clean configuration and by reducing the weight of the aircraft. Asymmetrical shedding (affecting less than all of the main rotor blades), however, can create extremely severe vibrations, depending on the amount of ice discharged, rotor system, and other factors.

The severity of vibrations resulting from asymmetrical shedding is generally a function of

ıe unbalanced weight of the rotor ystem, and therefore, may be xpected to be greater for semi-rigid 2-bladed) systems and 3-bladed ılly articulated systems than those otor systems employing four, five, r more main rotor blades.

In short, the severity of vibrations esulting from asymmetrical main otor shedding can be extremely azardous and operators can expect ıe vibration levels caused by symmetrical shedding to decrease ith an increase in the number of ain rotor blades (for a constant otor mass) since the imbalance presents a smaller percentage of ıe rotor mass. Conversely, bration levels may be expected to e greater when asymmetrical ıedding occurs on 2- and 3-bladed ystems.

Ice shedding from the main or tail otor can also produce problems part from an unbalanced rotor ystem. Though documentation is ss than authoritative, researchers ave experienced and expressed a oncern for structural or foreign bject damage to the helicopter's ıselage, rotors or engines resulting om rotor blade shedding. This articular hazard appears to be more reatening to large multi-engine rcraft and especially tandem rotor ystems.

Asymmetrical shedding can be inimized by avoiding static mperatures lower than $-5°$ C. esearch indicates that by operating environments of $-5°$ C, or armer, shedding will generally ccur symmetrically. Tests of UH-1 rcraft suggest that by rapidly arying main rotor speed or entering ıtorotation, symmetrical shedding ay be induced when static mperatures are $-5°$ C. or warmer. ollective and cyclic inputs were enerally ineffective in producing symmetrical shedding and may result in asymmetrical shedding. At temperatures below $-5°$ C., it is not possible for the pilot to induce shedding.

Most helicopters are not equipped with windshield anti-icing systems and, therefore, a complete or substantial loss of forward visibility will normally occur following prolonged flight in icing conditions. Normal defogging systems are not capable of preventing this windshield buildup. However, visibility usually remains clear through the side windows even in moderate icing.

Light helicopters such as the OH-6 and OH-58 are ''ultrasensitive'' to in-flight icing. The limited power available and smaller control surface make this type of aircraft extremely susceptible to icing.

Flight tests in icing conditions indicate that light helicopters experience a rapid degradation in aerodynamic characteristics and handling qualities with a corresponding increase in vibration levels. These limitations are vividly illustrated by icing flight tests with the OH-58A where five test flights were conducted. One flight in the cloud was as short as 1 minute and the longest was only 7 minutes.

Aviation weather education has oriented pilots to think of aircraft icing as a function of the following two atmospheric conditions that must prevail simultaneously:

- Free air temperature at or below freezing (0° C.)
- Supercooled visible liquid moisture or high humidity.

Though this explanation provides some insight into aircraft ice formation, it presents only a meager perspective of the icing environment for operators of rotary wing aircraft.

The inherent limitations of helicopters (service ceiling, range, endurance, speed, and power availability) and the previously discussed icing hazards require a more comprehensive understanding of in-flight icing conditions and their relationship to helicopter operations.

Research studies indicate that in-flight encounters with icing conditions occur most frequently in

Helicopter In-Flight Icing continued

the vicinity of frontal zones. In addition to the threat of icing in frontal clouds, frontal systems also create the necessary conditions for in-flight icing "outside of clouds."

Warm front icing may occur both below and above the frontal surface. Figure 1 illustrates how freezing rain or drizzle can be produced by precipitation falling through the front into subfreezing cold air below. As noted in figure 1, this particular form of icing is most often found when the temperature above the frontal inversion is greater than 0° C. and the temperature below is less than 0° C. Where temperatures above the frontal surface are subzero, ice pellets or snow may be noticed below the front and are normally not of concern to helicopter operators.

Icing in the clouds above the warm front's surface is characteristic of icing found in stratiform and stratocumulus clouds and usually consists of rime or mixed rime and clear ice.

Cold front icing normally occurs in an area preceding and following the front (figure 2). In this region, aircraft are likely to encounter the most intensive icing in clouds immediately above the frontal zone. Aircraft penetrating a cold front can expect clear icing to be prevalent in the system's clouds at the lower altitudes (0-15,000 feet msl) and a mix of clear and rime ice at higher altitudes.

Freezing rain or drizzle may also be experienced in a "shallow" or "slow-moving" front where the warm air is lifted over the advancing cold front. This condition often produces clouds and precipitation well behind the surface position of the front. Upon falling through a subfreezing cold front, the rain becomes supercooled and freezes on impact with the aircraft.

Aircraft icing is more probable and severe over mountainous or steep terrain than over low or flat elevations. The presence of a mountain range causes strong upward air currents on its windward side which are capable of supporting larger than average water droplets and thereby compounding the icin[g] hazard. The movement of a fronta[l] system, with its companion turbulence and updrafts across a mountain range, combines the normal frontal lift with the upslop[e] currents of the mountains to creat[e] an extremely hazardous environm[ent] for rotary wing aircraft.

The severest icing occurs above the crest and to the windward side of the ridges. This zone usually extends 4,000 to 5,000 feet above the mountain and can extend muc[h] higher when cumuliform clouds ha[ve] developed. ■

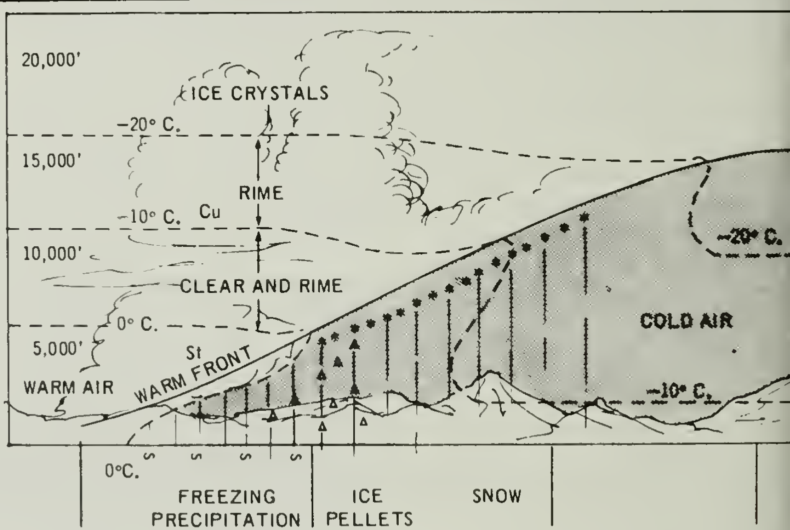


FIGURE 1 - Warm Front

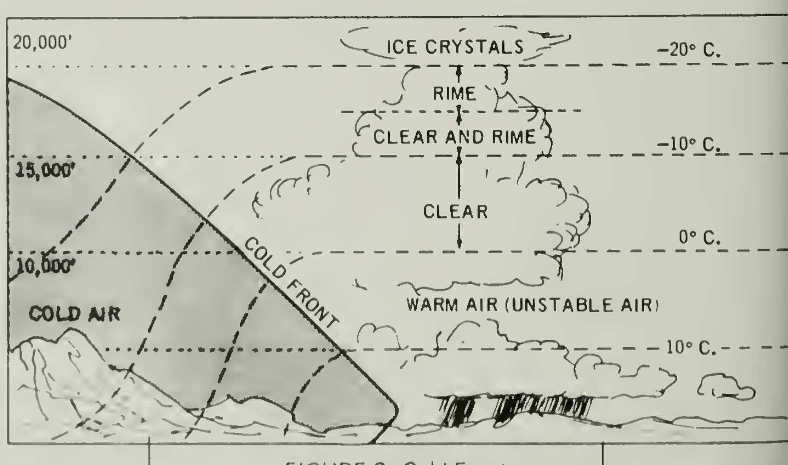


FIGURE 2 - Cold Front

OPS topics

OL Hazard

During Harrier hover
ht a 30″ X 30″ X 6″
ce of runway patching
terial was dislodged
o the runway surface. A
-135 departed shortly
r the Harrier cleared
runway and narrowly
sed hitting the dislodged
terial. The patch was
ermined to be several
rs old and composed of
naterial which had not
ered to the underlying
face. Corrective action
n by the unit included:

Designation of an un-
hed 2,000 ft section of
runway for Harrier
er flight operations.

Area situated so it
d be visually scanned
FOD following Harrier
rations. A runway
k to be conducted by
Operations following
pletion of any given
rier flight test sequence.

Designated the com-
rose as an alternate
er area.

Conducted a block-
block inspection to
tify any area in need
epair.

Mishap

o mishap resulted, but
r the right conditions one could have when a C-9A was given an erroneous altimeter setting by Approach Control and GCA. On PAR to a foreign air base, the C-9A was given an altimeter setting of 30.13. Strange, there developed a big difference between the barometric and radar altimeter readings. On the ramp the difference was 177 feet, with the pressure reading the

higher. The smart crew, always alert — and a bit suspicious — always cross checks.

Austerity Versus Safety

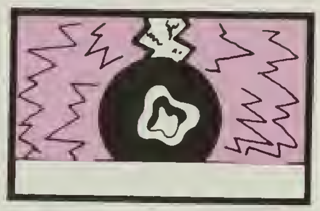
On a recent trip we stopped at a base that had put a severe restriction on the use of power carts in order to save MOGAS. The intent is good and there may not be a hazard created, but as the "energy belts" are tightened watch out that safety is not jeopardized by cutting things too close. Overflying higher than optimum for gross weight to save gas, or doing extended preflights or maintenance on battery power could critically reduce an already thin safety margin.

Reporting Hard Landings

A recent Class C mishap report sounded very "ho-hum" at first — about $25,000 worth of landing gear damage after a landing made with a 60 degree, 5-10 knot crosswind. On the subsequent takeoff, after taxi-back, the crew heard abnormal rubbing or scraping noises during gear retraction. After the full stop landing, the gear was written up as a "suspected landing gear rub." On post flight inspection, cracks were found in both main landing gear shelf bracket assemblies.

What really got our attention was what followed the discovery of the damage — the crew then returned to the aircraft and wrote up a hard landing. The crew had apparently discussed the taxi-back landing as firmer than normal, some felt it was a hard landing. One wonders what would have been the future of this aircraft had not the post flight inspection found visible damage or if the damage had been invisible?

Without getting into the whole bag of worms on the subject of integrity, we'd like to make a very serious point. No one likes to admit his pilot skills aren't always the very best, and the guy who has never spanked one down rather firmly just doesn't have the total hours logged yet — sooner or later it'll happen. When it does, how will you enter it in the post flight AFTO Forms 781? Sure, maintenance doesn't like extra work, especially when Ops is calling for more airframes than the



command saw fit to allocate to the whole wing. But, any maintenance man worth his salt would rather take the time to make sure his aircraft is right than have to answer to a mishap investigation board. If in doubt, don't hesitate, write it up! That's what special inspections are for — make sure the aircraft you turn over to the next aircrew is truly airworthy. Who knows, the next time you accidentally have to pull a few Gs, wouldn't you like to know the previous aircrews had written up all their hard landings? Lt Col John J. Griffin, Jr., Directorate of Aerospace Safety. ■

Bubble gum, bailing wire, and ASI

or . . . how we keep your aircraft from falling ap

MAJOR PAUL L. TIL
Directorate of Aerospace Sa

■ The AC climbed the ladder to check the front cockpit and stow his helmet bag prior to beginning his preflight. He mumbled under his breath as he saw the VGH recorder where he normally stowed his helmet bag.

Later, as he was preflighting the right wheel well, he saw the counting accelerometer and thought to himself, "I wonder what they really use that thing for?" He continued the walkaround, noticing the scab patches on the lower wing skin outside of the wingfold. Grasping the dump mast and shaking it to check for security, he thought back to the aircrew meeting two days ago when the squadron FSO briefed on the increasing number of lost dump masts. "Boy, these birds are getting old. I wonder when we are going to lose a wing or something else?"

Every crewmember is concerned about the structural soundness of the aircraft he flies, and rightfully so. The "man" responsible for your aircraft within AFLC is the System Manager, who monitors the structural condition of your aircraft through the Aircraft Structural Integrity Program (ASIP). ASIP has been around for some time, but the field of fracture mechanics has, within the last five years or so, developed to the point where the service life of an aircraft can be more accurately determined.

What Does All This Mean To You?

It means those structural components which will cause loss of the aircraft if they fail can be better identified and their operational lifetime established.

It means structural fatigue is NOT directly related to airframe flying hours.

It means that *how* the airframe flying hours are accumulated is the important factor.

It means changes in mission or tactics which cause fatigue to accumulate faster or slower can be identified.

How Is All This Done?

The methods vary by type and category of aircraft. Let's take the F-4 as an example.

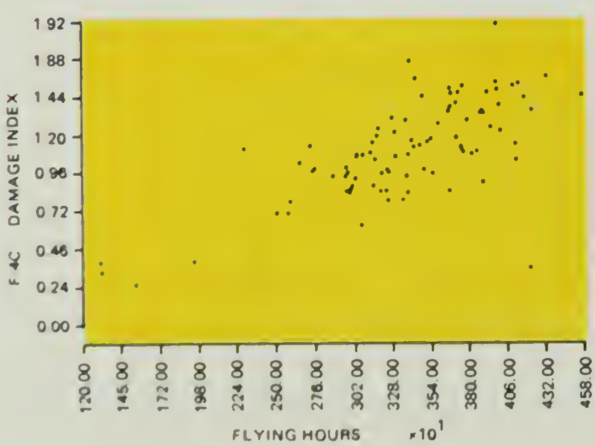
The F-4 was in the active inventory prior to an operational ASIP. As the state-of-the-art developed, four elements were identified and implemented for th F-4.

In 1973, a flight load survey w conducted. An instrumented F-4 flown through a wide variety of maneuvers to substantiate design loads and stress values. Changes these values were made as requir based on the flight tests.

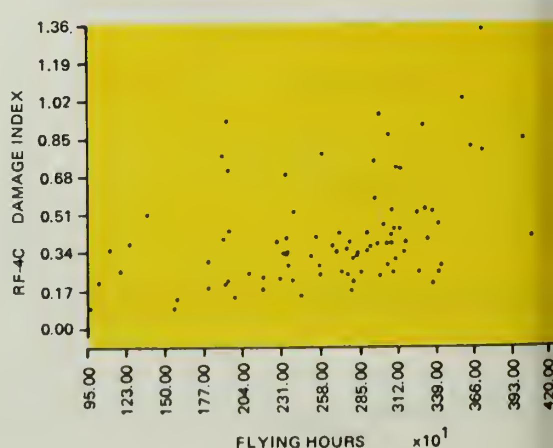
Following the flight load surve full scale fatigue testing was

Charts are representative of ASIP d Note difference between F-4C and RF damage index patterns, reflecting ferent missions. ASIP permits advar planning for maintenance and safety shown in chart, page 23. C-141A diag shows reference load point locations which data is calculated for stress anal

DAMAGE INDEX - FLYING HOURS
F-4C



DAMAGE INDEX – FLYING HOURS
RF-4C



rformed. Actual F-4 airframes
re tested in a laboratory using the
erage flight loads determined in
1973 test.

This information and current
uctural analysis methods were
ed to conduct a damage tolerance
sessment study. The purpose of
s study was to determine which
uctural components were critical
l to establish operational limits
the aircraft.

Now, we have a method of
nverting G loading or G-cycles to
mage index (DI).

What, You Say?

Now that we know how to relate
loading cycles to DI, all we need
know are the G-loading/cycles of
h aircraft. The counting
elerometer in every F/RF-4 and
VGH recorders in 13 per cent of
F-4 fleet provide this
ormation. The data are sent to
lahoma City ALC for computer
lysis. The end product is a by-
number listing of current
nage index. This can be compared to the operational limits given in terms of DI.

The same system can be applied to a bomber/transport type aircraft. Consider the C-141A for example. Since the flight profiles for bomber/transport remain fairly consistent, the airframes are not subject to as much scatter in the damage index, but the basic elements of ASIP remain the same.

Fatigue design mission profiles were defined for the C-141 in 1962, prior to present state-of-the-art structural analysis. These profiles were modified in 1968 by the first service life analysis (SLA I). VGH data was used in SLA I. In 1972, a second service life analysis (SLA II) was done based on VGH data and data collected from the individual aircraft service life monitoring program.

The results of SLA II were used in a damage tolerance assessment study. Based on the damage tolerance assessment study, a new magnetic tape strain recorder was installed to monitor 41 load/stress points.

OK, OK—What's The Bottom Line?

The bottom line! While scab patches and/or skin cracks may not be very esthetically pleasing, they don't necessarily mean the aircraft is ready to fall apart. With the cost of parts these days, it is not always economical to replace a panel or part as soon as a crack appears. ASIP allows the System Manager to replace those parts that have to be replaced without throwing away parts with useful lifetime. It also allows the System Manager to schedule aircraft for programmed depot maintenance by tail number, and to determine when the service life of a particular aircraft has been reached and it is ready for the "boneyard."

ASIP allows the MAJCOM to shift aircraft if they see a particular aircraft or block of aircraft accumulating damage too quickly.

ASIP is working for *you*! ■

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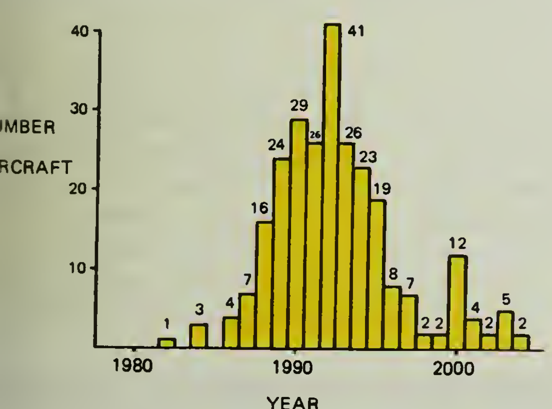

C-141A DADTA 6-COMPONENT
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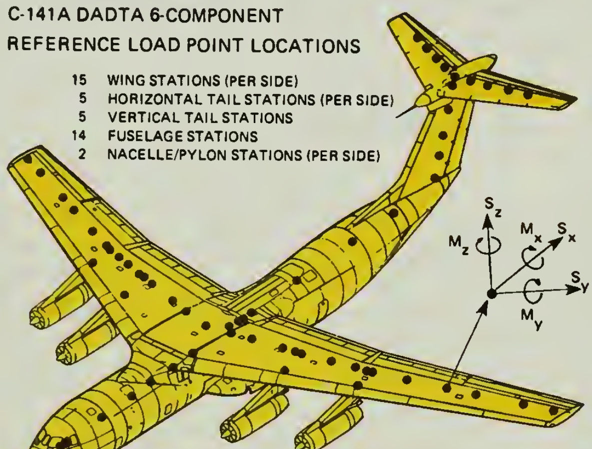

Pitot static system icing can cause confusing symptoms that may lead a pilot to take the wrong actions. Understanding of this phenomenon and how to deal with it is insurance against a disaster if your system ices.

A Little Ice Can Get You

■ An F-106 had just leveled off at FL 390 when the pilot noticed he had no VVI or altimeter indications. Then the airspeed indicator went, followed by intermittent flashing of the CADC fail light.

The problem? This pilot quickly (and correctly) opted for pitot static system icing. Having reached this decision, he promptly took the kind of actions that would save himself and his aircraft. He turned towar base and asked for help. Alert aircraft scrambled and joined on for recovery. At 5,000 feet the problem cleared, instrument indications became normal, and pilot made a ho-hum landing.

During cruise at FL 370, a :-141 lost number 2 mach and irspeed. Later, the number 1 ystem became inaccurate. The crew sed ground speed and power to naintain airspeed. They called for elp and another aircraft joined on ne C-141 and took it in for a safe pproach and landing.

☆ ☆ ☆ ☆

A B-727 crashed when the pilot nisread the situation and allowed ne aircraft to stall. As the aircraft limbed through 16,000 feet, ndicated airspeed began to increase bove normal for the climb attitude f the aircraft. Thinking they were an updraft, the crew attempted to duce airspeed by increasing pitch titude. At 24,000 feet, both verspeed warning horns sounded llowed by buffeting and stick naker. In an attempt to remain elow barber pole speed, they duced power to idle, which sulted in the stall.

☆ ☆ ☆ ☆

An Air Force aircraft countered an almost identical uation. Altitude and airspeed dications were increasing. To rrect these, the pilot retarded rottles and pushed forward on the ke. With no response, he tended the speed brake and finally wered the gear. The aircraft then parted and entered a spin. The ew ejected successfully.

☆ ☆ ☆ ☆

These and other similar mishaps ve a common theme — some sort pitot static system malfunction. e CADC can be affected also, and itself produce similar symptoms t malfunctions.

Failure of the pitot static system quently is insidious and catches the pilot by surprise. The cases cited above were all thought to have been caused by ice in the system. When that is the case, all indications may be normal during the flight until moisture in the system freezes. Most pilots would expect airspeed to decrease, possibly to zero, if the pitot static system ices over. Then if the airspeed increases, confusion may ensue with the pilot trying to reduce speed by retarding the throttle and using other techniques, e.g., pulling back on the pole, extending speed brakes or gear. Simultaneously, there probably would be an altitude increase indication which would further confuse the pilot. Rationale for this seeming contradiction is taken from an article from a previous issue of *Aerospace Safety:*

"Close examination of pitot tubes will reveal a small drain hole. This hole allows atmospheric moisture to drain out of the pitot system during flight. If this hole freezes before the inlet hole freezes, and then the inlet hole freezes over instantaneously, total pressure is trapped in the system. This total pressure is the dynamic pressure that was being rammed into the pitot tube, plus the static pressure existing at the altitude the aircraft was maintaining. When this happens, the airspeed indicator acts like an altimeter. When altitude is increased, static pressure decreases and the airspeed indication increases. Of course, the reverse is true when altitude decreases. The result of both inlet and drain hole freeze-up can be disastrous."

If you suspect your pressure instruments are reading erroneously because of pitot static failure, you have several alternatives besides stalling the bird. AFM 51-37 recommends using the attitude indicator as the primary reference with a known power setting. If you have an angle-of-attack indicator, use it. Using these, in VMC, you should be able to safely fly the aircraft. Then, call for help and get a join-up for an escorted approach and landing.

You can also get ground speed from a Center and some approach controls. However, don't forget to convert to airspeed — that's the one that's important.

Another action that has been successful is providing an alternate static source by breaking or pushing out the glass on a non-essential instrument such as the mach indicator or VVI. Then depressurize and descend if necessary. The indicated readings probably will not be perfectly accurate, but they should be close enough.

A primary contributor to pitot static icing is the aircraft being subjected to heavy rain prior to flight. Even without freezing, water in the system can foul up the airspeed indication. It is not unusual for pilot and copilot indicators to read 20 or more knots differently *on takeoff*. What then? Which do you believe? Neither! Abort, if you are below rejection speed.

Any time your instruments seem to be giving funny readings, get suspicious. Suspicious, not panicky. Be calm and remember what you learned about flying. What the Dash One says. What you've read here. Then — fly the airplane: Pitot heat on, known power setting, attitude indicator, angle-of-attack.

Call for help. Don't penetrate any weather without an escort. You'll fly again tomorrow. ■

THE PROFESSIONAL APPROACH

AIR FORCE COMMUNICATIONS COMMAND
Scott AFB, IL

■**Q:** You have just departed Scott AFB with a destination of Travis AFB, passing 15,000′, climbing to FL 350. You're on an IFR Flight Plan in VMC conditions and lose two-way radio communications. What do you do?

A: Well, I'd look around the cockpit and see what the Flight Information Publication, IFR Supplement has to say about losing two-way radio communications. I can't find it anywhere!

In that case, we'll give you the answer. However, it is in your best interest to be fully informed on the US procedures (Federal Aviation Regulations 91.127 and 91.3(b) for two-way radio failure.

Now, let's answer the question.

On an IFR Flight Plan, the transponder should be adjusted to reply on Mode 3/A Code 7700 for one minute, then changed to Mode 3/A Code 7600. This process should be repeated each 15 minutes for the duration of the flight. Air Traffic Control Facilities will attempt to communicate by transmitting on guard frequencies and available NAVAID frequencies.

If you are able to maintain flight in VMC, then continue flight under VFR and land as soon as practicable and notify ATC. This procedure also applies when two-way radio failure occurs while operating in Positive Control Airspace (PCA). The primary objective of this provision in FAR 91.127 is to preclude extended IFR operation in the air traffic control system in VMC. Pilots should recognize that operating under these conditions may unnecessarily, as well as adversely, affect other users of the airspace, since ATC may be required to reroute or delay other users in order to protect the failure aircraft, however, it is not intended that the require-

ment to "land as soon as practicable" be constru
to mean "as soon as possible." You, the pilot, re
the prerogative of exercising your best judgm
and you are not required to land at an unauthori
airport, at an airport unsuitable for the type of
craft flown, or to land only minutes short of y
intended destination. The primary objective of
provision is to preclude extended IFR operation
the air traffic control system in VMC.

Q: Now let's take that same problem, that you h
departed Scott AFB passing 15,000′, climbing
FL 350. You are on an IFR Flight Plan and in I
Weather reports indicate that you will remain in I
You lose two-way radio communications. Now w
do you do?

A: Adjust the transponder as indicated in our
answer. Then continue the flight by the ro
assigned in the last ATC clearance received. If
are being radar vectored, proceed by the di
route from the point of radio failure to the fix, ro
or airway specified in the vector clearance; in
absence of an assigned route, proceed by
route that ATC has advised that may be expecte
a further clearance; or in the absence of an assig
route that ATC has advised may be expected i
further clearance, by the route filed in the flight p
The route should be flown at the highest of the
lowing altitudes or flight levels for the route segm
being flown. Either the altitude or flight level
assigned; when appropriate the minimum altitu
flight level *(this shall apply for only the segmen
the route where the minimum altitude/flight le
is higher than the ATC assigned altitude);* or
altitude or flight level ATC advised may be expec
in a further clearance. The intent of the rule is
a pilot who has experienced two-way radio fai
should, during any segment of route, fly at the
propriate altitude specified in the rule for that *p
ticular segment.* The appropriate altitude in whi

er of the three is the highest in each given phase light: (1) The altitude or flight level last assigned; The MEA; or (3) The altitude or flight level the ot has been advised to expect in a further clear-ce. Now if holding instructions have been re-ved, leave the holding fix at the expect-further-arance time received, or if an expect-further-arance time has not been received leave the ding fix in order to arrive over the fix from which approach begins as close as possible to the ected approach clearance time. Begin descent n the en route altitude or flight level upon reach-the fix from which the approach begins, but not ore the expected-approach-clearance time or estimated time of arrival as derived from the nt plan or as amended by ATC.

holding is necessary at the IAF for the destina-airport, holding and descent to the initial ap-ach altitude or initial penetration altitude/flight el for the execution of the penetration and/or rument approach shall be accomplished in a ding pattern in accordance with the instrument roach procedure booklet. If no holding pattern is icted, holding and descent will be accomplished holding pattern on the side of the final approach rse to the fix on which the procedure turn is scribed.

rcraft, on a flight in which a delay en route is nned, will commence descent at the destina-at the estimated time of arrival (ETA) derived n the estimated time en route (ETE) plus any y for which an ATC clearance has been received.

One last question. You're approaching Travis roach control airspace. You're in your en route cent, passing through FL 260, descending to 12,000′, and you lose two-way radio communications. Now what do you do?

A: Adjust the transponder as indicated in our first answer. Then proceed to the initial approach fix/radio facility to be used for the approach or destination and execute the published approach. The altitude to be maintained, and from which the approach is to be executed, is the highest of the following:

a. The last assigned altitude.

b. The minimum safe altitude.

c. The emergency safe altitude if the point of communications failure or initial approach fix is more than 25 miles from the navigation facility for the approach.

Now we know it is virtually impossible to provide regulations and procedures applicable to all possible situations associated with two-way radio communications failure. During two-way radio communications failure when confronted by a situation not covered in a regulation, you are expected to exercise good judgment in whatever action you elect to take. Should the situation so dictate, you should not be reluctant to use the emergency action contained in FAR 91.3(b). However, procedures have been established and you are required to comply with FAR 91.127. Air Traffic Control will be expecting you to follow appropriate two-way lost communication procedures.

What we have gone over are the procedures to follow for two-way radio failure in the CONUS. If you are flying in foreign airspace, use ICAO two-way lost communications procedures. These are also in the Flight Information Publication, IFR Supplement. ■

CAPTAIN

Gary L. Lechtenberg

CAPTAIN

William T. Malarkey

48th Tactical Fighter Wing

■ On 1 May 1979, Captain Lechtenberg, Aircraft Commander, and Captain Malarkey, Instructor Pilot, departed RAF Lakenheath on an in-theater transition flight for Captain Lechtenberg, his first flight in the F-111F. Approximately 75 miles north of Lakenheath, at assigned FL 150, .75 mach and engines stabilized, a left bleed duct light and left engine fire light illuminated with a simultaneous thump felt by the crew. Another thump which was later determined to be an explosion, followed within seconds. The left engine fire light remained on for 5 seconds. The aircrew then tested the fire warning system, and the system failed the test, indicating possible fire damage. While the extent of the fire damage was not known, the fire had already caused multiple failures in critical aircraft systems indicators. Readings critical to monitoring flight included wing sweep which read 60° when in fact the wings were at 16°; aft fuel quantity read 12,000 lbs which normally would indicate a severe CG problem; the flap indicator was frozen from which the crew could not confirm proper configuration for landing. Also, an inlet hot light was on, and all the caution lights associated with single engine emergency were illuminated. In addition to the in-flight fire and explosion, the crew now had nine different erroneous, critical indications to analyze to properly configure for an emergency landing. About 30 miles from the field, the left fire light came on again and remained on for approximately one minute. The crew configured for a single engine approach, disregarded the erroneous indications and confirmed landing configuration to the best of their ability visually. The weather was deteriorating with an existing ragged ceiling estimated at 500 feet and 2 miles visibility in rain and snow showers. The PAR was out with only surveillance radar available. A surveillance single engine approach was flown with confusing and severely limited cockpit instrumentation. During the last 2,000 feet of landing rollout, the left fire light again illuminated. As the aircraft turned off the runway, tower notified the crew that smoke and flames were coming from the left engine area. The crew cleared the runway, shut down and egressed from the aircraft. Emergency response equipment extinguished fires in the aft section which had resulted in fuel cell explosions, external panels blown into the vertical stab and general fire damage to the aft section of the aircraft. The superior airmanship, crew coordination, and professional response of Captains Lechtenberg and Malarkey prevented possible loss of life and the loss of a valuable aircraft. WELL DONE! ■

☆U.S. Government Printing Office 1980—683-214/4

STATES AIR FORCE

Well Done Award

...resented for

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to the

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Program.

MAJOR **David N. Peters**

CAPTAIN **Edgar J. Bethart, Jr.**

9th Strategic Reconnaissance Wing
Beale Air Force Base, California

■ On 28 April 1979, Major Peters, Aircraft Commander, and Captain Bethart, Reconnaissance Systems Officer, flew an SR-71 reconnaissance sortie. During the recovery phase, the aircraft had two serious engine malfunctions. As the aircraft was descending through FL 300, the right engine experienced a series of compressor stalls. Major Peters decided to shut down the engine and make a single engine approach and landing to the recovery base. An emergency was declared and vectors were received to accomplish a PAR approach to the airfield. As the aircraft was descending to radar pattern altitude, the left engine oil pressure started to fluctuate and the oil quantity started to rapidly deplete. This was accompanied by power surges and a cockpit odor associated with heated metal. Faced with the impending loss of the left engine, Major Peters attempted a restart on the shut-down right engine. Although the restart was successful, the engine continued to compressor stall. It provided flight control hydraulic pressure, but little additional thrust. Major Peters terminated the PAR and made a modified visual approach, remaining high above the normal glide path and delaying gear extension until 5 miles on final. Approximately 1½ miles on final, the left engine began to surge and he placed the throttle to the cutoff position. He completed the landing and shut down the right engine to prevent an overtemp condition. The timely and decisive actions by Major Peters and the close and highly professional crew coordination between him and Captain Bethart resulted in the safe recovery of a valuable aircraft. WELL DONE! ■


TAKE CARE
we SHARE the air

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS MARCH 1980

IN THIS ISSUE

YOU GOT IT!

■ When I hang up this blue suit and my fighter pilot togs the first of March, after 35 years, I'm not so sure they will stay put. But before I do, there are a few things I have said many times that I want to say once more.

First of all, flying is fun; it is also a deadly serious profession. Akin to that, I'm an ops type! I've always been an ops type, and I'm proud of that. Secondly, I'm a safety guy. I've always been a safety guy, and I'm proud of that, too. I never had the title of a safety guy until I became the Director of Aerospace Safety, but I've been a commander: an aircraft commander, a flight commander, a squadron commander and a wing commander. In each of those capacities, I was a safety guy, because safety is a function of command in each one of them. Safety is also a by-product of strong leadership. So is good management. *We manage resources–we lead people!*

Positive, strong leadership by the flight leader, the element leader or the aircraft commander is the key to successful mission accomplishment. The mission is not successfully accomplished until everyone is safely home. If we are to continue our historical reduction of aircraft mishaps, we must decrease the number of them caused by human factors. That is a leadership challenge. There are no dumb pilots. When a pilot makes a mistake, we must remember that somebody trained him, somebody committed him and somebody scheduled him. Leadership by those "somebodies" can prevent mistakes that lead to disaster.

Safety is not paramount—readiness is. Readiness is probably more important now than it has been at any time since World War II. The loss of over a wing of airplanes a year has an unacceptable impact on our combat capability. So I challenge each of you with an old adage—lead, follow or get out of the way.

As Director of Aerospace Safety, I have had tremendous support from across the Air Force and our sister services. I have enjoyed the challenge that goes with the job. I enlist that same support for the new guy. Be ready, fly smart and don't relax until you, your crew or your flight is back, mission accomplished —safely. You got it! ■

Garry A. Willard Jr.

GARRY A. WILLARD, JR
Brigadier General, USAF
Director of Aerospace Safety

ITED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

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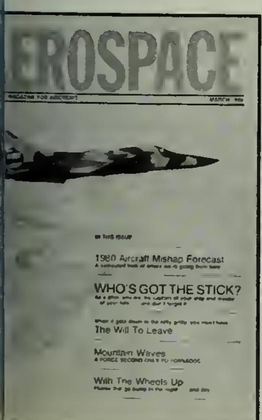

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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1980 Aircraft Misha

MR. ROGER G. CREWSE • Directorate of Aerospace Safety

■ A mishap forecast should be the reflection of mishap potential which exists in the support and operation of our equipment. If we have accurately defined the types of mishaps our weapon systems are likely to have, based on their history and the mission which they fly, and if we are able to accurately assess our current trending, then we should be able to accurately forecast what will happen in a future period.

The forecast that we are talking about here is the aircraft mishap forecast for 1980 and it is based on 3,200,000 flying hours. The reason the flying hours are so important is that each element of an aircraft's mishap history has a mishap rate per 100,000 hours established for it. If, of course, we fly more than 3,200,000 hours we should have more mishaps. If we fly less than 3,200,000 hours we should have fewer mishaps.

This relationship isn't exactly a direct one, because if we fly a lot more than 3,200,000 hours and our maintenance and supply folks cannot handle it, the mishap potential starts to rise; therefore, the rate starts to rise, resulting in a mishap number out of proportion to the increase in flying hours. By the same token, if our flying hours are reduced substantially, aircrew proficiency may become a problem and once again the mishap numbers may not reduce in proportion to the reduced number of flying hours.

There is one other point that needs to be made on forecasting and it is this: If the mishap potential is one-third of a mishap per 100,000 hours, then 300,000 hours must be flown before that potential is fully cycled. If at the end of 300,000 plus hours that particular type mishap has not occurred and the trending is down, then it would be safe to assume that the mishap potential has reduced, either through training, modification programs, or because we were wrong in the first place.

If a potential of .33 mishaps does exist in the aircraft and it flies 100,000 hours a year the first year, then the potential would be .33 of a mishap; the second year would be

.66 and the third year 1, if in the preceding 2 years the mishap in fa did not occur.

The potential is a must when examining the type of mishaps eac aircraft has. For instance, for the A-7, the mishap potential for a pil induced control loss mishap in 198 is 2.55 mishaps based on 100,000 hours to be flown. We believe tha this potential is too high. It was established without automatic maneuvering flaps installed on the aircraft. We believe that while the potential *was* 2.55, the actual now with AMF coming in, will be 1. When AMF are installed on all A aircraft, that potential may drop ev further, perhaps to approximately . instead of 2.55 mishaps per 100,00 hours. Enough of the numbers and the methodology. The forecast is what we really set about discussing in this particular piece.

During 1980 we forecast 91 Clas A mishaps (see Chart 1 for mishap definitions) for a rate per 100,000 2.8. We believe that those 91 Class A mishaps will result in 81 destroy aircraft for a rate of 2.5 destroyed aircraft per 100,000 hours. We also believe that there will be 74 Class mishaps in 1980, resulting in a Cla B mishap rate of 2.3 per 100,000 hours flown (Chart 2).

Forty-four mishaps will result fro operational factors. Logistics mishaps, that is maintenance, part failures, design, etc., will account for 43 Class A mishaps in 1980. Weather, miscellaneous factors, and undetermined mishaps will be involved in four Class A's during

FORECAST

CHART 1
MISHAP CLASS DEFINITIONS

. **CLASS A MISHAP.** A mishap resulting in:
- (1) Total cost of $200,000 or more for injury, occupational illness, and property damage, or
- (2) A fatality, or
- (3) Destruction of, or damage beyond economical repair to, an Air Force aircraft.

. **CLASS B MISHAP.** A mishap resulting in total cost of $50,000 or more, but less than $200,000, for injury, occupational illness, and property damage.

. **CLASS C MISHAP.** A mishap resulting in:
- (1) Total damage costs of $300 or more, but less than $50,000. or
- (2) An injury or occupational illness resulting in a loss workday case involving days away from work, or
- (3) A mishap which does not meet the above criteria but for which reporting is required. . . .—*From AFR 127-4.*

CHART 2

Forecast 1980 Mishaps (Based on 3,200,000 Flying Hours)

	RATE	NUMBER
lass A	2.8	91
Destroyed	2.5	81
lass B	2.3	74
otal Class A and B	5.1	165

1980 CLASS A FORECAST

TYPE MISHAP	
Operations	44
Logistics	43
Other	4
Total	91
Rate	2.8*

*3,200,000 flying hours.

1980 DESTROYED AIRCRAFT FORECAST (Based on 3,200,000 Flying Hours)

YPE MISHAP	TOTAL	TYPE MISHAP	TOTAL
ontrol Loss (Pilot Induced)	14	Aircraft Fuel	2
ollision/Gnd (Non-Range)	12	Landing Gear	4
ollision/Gnd (Range)	6	Bleed Air	1
ldair	6	Hydraulics/Pneumatics	1
akeoff/Landing (Pilot)	4	Structure	2
ngine Failure	16	Electrical	3
light Controls	6	Miscellaneous	4
		Total	81

1980 for the total of 91. The total number of mishaps reflect an expectation that we will have slightly fewer Class A's and destroyed aircraft mishaps during 1980 than we did in 1979, and slightly more Class B mishaps than we did in 1979. While the numbers of mishaps are not expected to change substantially from last year's experience, the makeup of these mishaps will be quite different, we think.

Last year, 65 of the 94 Class A mishaps were operational in nature. This year we forecast only 44 will be. The last quarter of 1979 and the first month of 1980 have signaled, we think, a valid downward trend in operational mishaps. The majority of the operational reductions are expected in the fighter/attack aircraft.

Last year there were 51 fighter/attack operational Class A mishaps. This year there are 29 forecasted. The reductions are in two major areas – collisions with the ground and control losses. We have forecasted eight fighter/attack control losses for 1980 as opposed to the 17 which occurred in 1979. We have forecasted seven fighter/attack collisions with the ground nonrange for 1980 as opposed to 16 which occurred in 1979. Eighteen of the 22 fewer operational mishaps we expect to have this year than last, then, are in the fighter/attack collision with the ground and control loss categories.

Why do we expect the large reduction? For one thing our commanders and our aircrews have learned a lot about our mishap exposure during the past 2 years, and

FORECAST

continued

what they have learned has been converted to action and that action has been effective the last 4 months. The collision with the ground and control loss categories were the ones that soared in the past 3 years over all norms established in the 1970s. These two categories we believe will be most responsive to corrective action. The remainder of the operational categories in the fighter/attack aircraft mishaps will remain rather stable. They were low, they stayed low, and we think they will remain low during 1980.

In the logistics area quite a different picture is expected from what occurred last year. We hope we are wrong but we think that we lucked out in a good many areas. Our logistics trending has remained high. The Class Cs indicate that we were extremely fortunate in many, many instances involving engine, flight control, electrical and fuel system malfunctions.

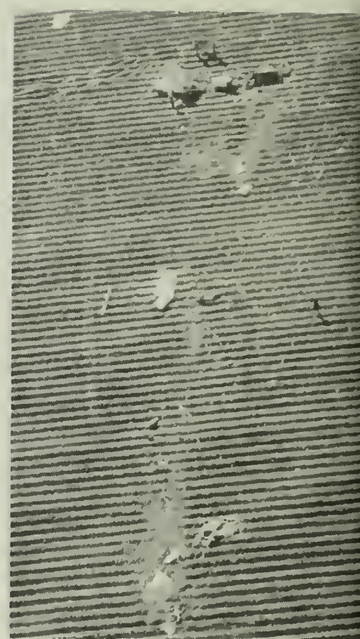
Last year we had 24 Class A mishaps involving logistics factors. In 1980 we think this will rise substantially to 43. The largest increase is expected in those Class A mishaps which are engine-related. Ten occurred last year — we think 20 will occur this year.

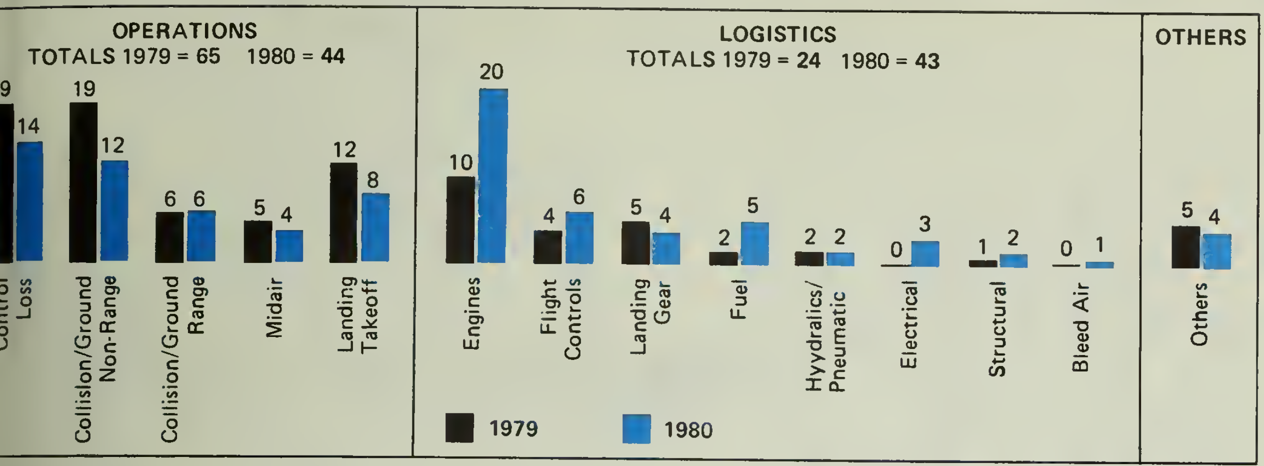
All aircraft types are expected to experience increases in engine-related mishaps. Ten of the 19 increase in logistics related mishaps we forecast for 1980 will be caused by engines. The remainder of the increases are made up by small increases in flight control, fuel systems, electrical systems, and structural failures. The rationale for the increases follows.

We don't believe the F-15, A-7, F-105, or F-106 can repeat last year's superb performance in the engine category. We expect the heavies will also have engine problems. We have seen Class C upward trends and Class B mishap frequency increases in the B-52, C-135, C-141, and C-5s. These numbers are small, and while they probably are no problem for supply, maintenance, or for the operations folks, they do provide Class A mishap exposure. The exposure is primarily because of fire or heat damage or catastrophic failure which damaged the aircraft. It is also possible that one of these failures will occur just at the wrong time and the pilot will not be able to cope with it.

Landing gear failures seem to be on the rise in all types of aircraft, but considerable action underway at the present, we believe, will cope with the gear malfunctions, and we don't expect to see a Class A increase over last year. With the Class B's it's a different story which will be discussed later.

Flight controls, fuel systems, and bleed air problems also seem to be on the rise, based on our current trending. All aircraft are involved. Bleed air failures, both bleed air and engine parts which carry bleed air, seem to be on the rise almost across-the-board. While the frequency is low, their potential to cause the loss of an aircraft is extremely high. We may have undercalled this category.





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performance, which resulted in
lowest number of logistics
aps in our history, was directly
endent upon mishap frequency
rovements in those systems just
tioned.
ur Class Bs are almost entirely
stics in nature. Thirteen of the 74
ch are forecasted for 1980 are
ational. Eleven of the 13 involve
ing mishaps and two, takeoff
aps. In 52 of the 74 which are
cted to be logistics in nature, 12
lve engine-related malfunctions,
ngine FOD, and 10 landing gear
res. We expect a slight increase
ur Class B's over last year and
year before, primarily because
er cost engines and airframes are
ring the inventory in ever-
easing numbers. The $50,000
s B threshold will be reached
e easily with less damage than
the older aircraft. The 20 engine
) Class B mishaps will result
arily from F-15, F-16, and
3-111 aircraft. Their overall FOD
isn't higher or as high in many
s as other aircraft, but the engine
e is such that the $50,000
shold is reached with less damage
ompared to some of the other
nes in the inventory.
anding gear failures (which
ide wheels, tires, and brakes), as
mentioned earlier, have been
aling an increase for the past 10
to 12 months. Trending is up. The damage resulting from these types of failures more often is Class B than Class A, but the fact is, the potential in these systems, primarily fighter and cargo aircraft, is high.

Birdstrikes, lightning strikes, hail damage, facilities, etc., make up the remaining nine of the Class B mishaps we expect to have in 1980.

It is important to remember that our forecasts are not goals. The forecast is based on our evaluation of the exposure in our weapon systems, converted to mishap numbers, and it supposes that nothing will change during the period the forecast covers. If something changes to increase exposure then, of course, the numbers will go up. On the other hand, if something changes to decrease exposure, then the numbers will be reduced. Repeat— these are not goals.

There should be no warm feeling if the numbers shown are met at the end of 1980.

A realistic and attainable goal on the other hand, would be 78 to 82 Class A mishaps for a rate of 2.5. To accomplish that goal would require holding the operational mishaps to the level forecasted, or lower, and having no more than 36 logistics mishaps. Is it possible? Of course it is. We only had 24 logistics Class A mishaps last year. Probably a greater challenge is reducing the operational mishaps from the 65 which occurred in 1979 to the 44 which we have forecasted for 1980.

Have we ever had as few as 44 operational mishaps in our recent history? We certainly have, and it wasn't very long ago either. In 1977 the Air Force experienced 42 Class A mishaps resulting from operational factors. That same year there were 38 Class A mishaps which resulted from logistics factors. Nine miscellaneous/undetermined/other type mishaps accounted for the remainder. A grand total of 89 Class A mishaps occurred in 1977.

The final word is that the United States Air Force mission is not safety— it's the defense of our country. Safety is a product of an efficient, effective operation. The better we do the job and accomplish our mission, the fewer mishaps we will have as a welcome and natural byproduct, and that should be our goal! (A detailed, by aircraft, forecast will appear in the April issue of the *Air Force Safety Journal.)* ■

Wire Strike!

During 1979 seven USAF aircraft were involved in wire strikes, two of which were destroyed and th crews killed. Two of the aircraft were helicopters. Although USAF experience is not as great as the Army's, with its many low flying helicopters, the loss of any aircraft or crew is serious business. Many of the Army actions are applicable to our low flying aircraft; therefore, we are presenting this Army narrative on low level wire strikes, from U.S. Army *Flight Fax*.

Synopsis

■ An OH-58 on an area surveillance mission during a field training exercise hit several telephone wires strung across a river. The copilot made an approach to a sandbar 1,100 feet downstream, with wires dragging from the right skid. Just before the aircraft was landed, the dragging wires caused the nose to tuck, and the aircraft crashed nose low. The pilot, copilot, and crew chief sustained major injuries.

History of Flight

The aerial surveillance mission was delayed two hours due to poor visibility in the area. When the flight, consisting of an OH-58 and an AH-1G, was able to take off, visibility was estimated at one mile with no ceiling. Visibility improved during the mission to about two to three miles with haze and fog.

All three modes of terrain flight were used. The copilot was flying the OH-58, while the pilot performed navigation duties.

Near the end of the mission, the pilot told the copilot to cross a river on a diagonal course to check one more area. As they left the higher ground of the hills, the copilot started a descent to conform to contour flying techniques. Seconds later, the pilot saw wires in front of them just before the helicopter, flying at 50 knots and 70 feet above the river, hit the wires.

The copilot selected a sandbar in the river as his landing site and started an approach. Just before the aircraft was landed, wires dragging from the right skid caused the nose to tuck and the aircraft crashed. Both pilots were able to exit through an opening in the aircraft, but the crew chief, because of his injuries, remained in the aircraft until medevac personnel arrived.

The area was not the normal training area for the unit. Before the exercise, 1:50,000 tactical maps were issued to the aviators. Two units were assigned training missions in the area to locate and mark hazards and allow the aviat to become familiar with the area. Hazards were posted on one map The map was made available to a aviators so they could post their maps. The hazards were also mar on a 1:100,000 map overlay maintained in operations during t field exercise. Both of the maps were incomplete. The wire struck the OH-58 was not marked on eit of the maps. In fact, when the mishap occurred, there were no hazards posted in the southern pa of the exercise area. The unit had another wire strike accident seven days after this one, and the aviato involved still did not have the wi that was struck in the first accide marked on his map.

wmember Experience

he 22-year-old pilot had almost hours rotary wing flight time, more than 100 hours in the 58. The 30-year-old copilot had e than 350 rotary wing hours, more than 200 hours in the 58.

nmentary

he absence of a wire strike ection system was a factor in accident. Wire strikes have been oblem since the early days of y aviation. They will continue e a problem until aircraft are pped with a wire protection em. An OH-58 wire strike em will be fielded in Canada in ary 1980.

addition to this factor, there e three specific errors which ld have resulted in the crew not wing the location of the wire rds along their flight route. Any of these errors could have sed the accident.

he first error was failure to provide required information to the flight crew. FM 1-51 requires units to maintain hazard maps of the areas of operation. It also states that this responsibility should be assigned to a specific individual. There was confusion in the unit as to who was responsible for the hazard map. Since it could not be substantiated that the operations officer delegated this responsibility, it was concluded that the responsibility and the tasks involved remained with the operations officer.

The hazard map constructed by the unit was inadequate. There were no hazards marked on the map in the area assigned for the mission. The area had not been reconned for hazards. The operations officer was unaware of this deficiency until after the accident. The unit SOP did not include instructions which would ensure aviators were provided hazards information in their area of operation before terrain flight missions.

The second error was inadequate flight planning. The pilot made no attempt to mark the hazards identified on the unit hazards map on his map. He understood this was a required task, but he omitted it. He thought he and the copilot could see the hazards.

The third error was a navigational error. The pilot thought he was on the eastern boundary of the assigned area instead of the western boundary. It is not known why this error was made. The pilot obviously had not been disoriented during the majority of the mission. He stated that he was keeping up with the navigational task and thought he knew where he was at the time of the accident.

The crew chief should not have been aboard the aircraft. Only mission-essential personnel are to be carried on tactical training flights. ■

■ In the past few years, I've noticed a trend in our airplane driving habits that has disturbed me to the point where I have doubts about our ability to fly in a proper military manner. For years, the bar talk about the flying game has invariably centered on the decline in our ability to do our job. We tend to sit around crying in our beer about every imaginable subject, from lack of leadership through the gamut to no flying time to square-filling to pencil whipping to the DRPCB's in MPC to additional duties to mobile control to overtasking, and so on, ad nauseam. I think the gripes are justified. I could come up with a few thousand choice words on any of the above subjects. But gripes aren't what this article is about. What I'm writing about here is airplane driving.

It seems like griping has taken the place of airplane talk – do you guys remember the stag bar of yesteryear? Some time ago, one couldn't walk into one of those places without getting clotheslined by an errant five-fingered MIG-21 which was closely followed by a poke in the eye with the 20mm cannon (Brrrrappp!) cleverly disguised as an index finger. The talk, the mood, the noise were all flying, flying, flying (with an occasional Bangkok ''war'' story thrown in for variety). A similar scene occurred in every squadron lounge in the Air Force every day. What's happened? Why has it changed?

I'll tell you what I think – I think that the average Joe Jetjock has given up on himself and the Air Force. I think that he has become overwhelmed with the size, the complexity, and impersonality of the US Air Force to the point that he has forgotten (or perhaps never learned) where he fits into the total scheme of things.

To explore this idea a little farther let me talk a little bit about the F-15 Eagle jet. For you folks who don't know too much about it, let me digress a little to explain some things. There is no occupation in the whole world that is more demanding, challenging, or more good clean fun than strapping on an Eagle and jumping into the middle of a giant air-to-air dogfight with it. That doggone airplane is limited only by the guy in the cockpit. It has enough sustained G capability to make any pilot cry for mercy; it has ''seventy eleven'' different buttons and levers that perform about four hundred and ''seventy eleven'' different functions and three different air-to-air weapons

WHO'S GOT THE STICK? or–
ear's theory of fighter aviation

JOR GARY L. SHOLDERS · Directorate of Aerospace Safety

tems that can zap bad guys in the nkling of an eye. The Eagle jet, short, is the world's foremost ld-blooded) pleasure machine. I most of my peers in the fighter iness would sell our souls to the il and accept a demotion to manent second lieutenant for a nce to fly that thing.

Yet, the plain facts are that guys leaving the Air Force from the kpit of an Eagle jet in droves. It's ently obvious to me that our ng Eagle drivers either are ware of, or unwilling to accept, challenge that faces them in the gle driving business. I find it hard believe that they are unwilling; ond lieutenants, for example, are most wonderful people in the ole Air Force. They are tivated, smart, and untainted by icism. Somehow, all along the our Air Force fails to instill that l sense of challenge and self-th into those wonderful people. institution has been unable to vince our young jocks that *they e the stick.* For whatever reason, young fighter pilot doesn't ceive a continuing challenge /or job satisfaction in the US Air ce.

Let's try to turn that attitude around. Supervisors and line jocks alike can all do a heck of a lot to shake that stick and place it firmly in the hands of the guy who owns it; namely, good old Harvey Knucklefutz, the average tactical airplane driver. I don't think that we have to establish a whole new round of regulations, studies, or neat new training programs to do that either. Sure, they help— Operation Buck Stop of ATC is a well received formal program to put the stick where it belongs. TAC has recently increased the number of solo sorties in their F-4 training programs, and Air Force-wide adoption of the "Buck Stop" philosophy is now official.

The funny thing about this whole thing, though, is that there has *always* been an opportunity to grab that stick. For example, I don't feel that my authority to operate my air machine has been unduly hampered by the bureaucracy. Sure, every once in a while I've had to live with a delta sierra rule or situation, but I have *never* felt that someone else has been in charge of my airplane. In my experience in the fighter business I've seen, with few exceptions, that the aggressive, innovative and good fighter drivers rarely feel unchallenged. I think that's because they immediately got a tally ho on the stick, grabbed it, and never let go.

Let me share a few personal experiences that I've had over the years that have served to help me get a hold on the stick.

The first two stories are about folks who figured out how to start young jocks along the road to individual responsibility.

Story nr 1. *The Supervisor Who Knew How to Supervise.* Once, when I was one of the greenest of green buck IP's in the F-4, I was called to the DO's office for my prelaunch lecture into my IP career. The DO said something like this: "Around here we fly according to the book, etc. . . ." Standard lecture, I thought. He's gonna chew me out before I even go to work. The lecture, however, took an interesting turn a few minutes later when it went something like this: "I realize that every situation is not covered by the book. You are one of my IP's, *I trust you*, and you are getting paid for your superior judgment. Exercise it as you see fit— I will back you to the hilt." I walked out of that guy's office feeling about 12 feet tall— I would have committed hari-kari before I crossed that man. Although we rarely spoke after that day, I've always considered him to be the best

WHO'S GOT THE STICK? continued

DO I've ever worked for. He now has more stars than I have feet.

Story nr 2. *Noninstructional Instruction*. Once I developed a theory of aviation which stated that my students in the F-4 were too dependent upon my inputs and weren't thinking for themselves. So, I turned off the intercom after takeoff on the student's first ride in the airplane and didn't turn it on again until we arrived somewhere near homedrome at the completion of the mission. You should have seen those guys thrash around! My theory of aviation had been confirmed in spades. Of course, we accomplished absolutely nothing on that first ride. The pipe-smoking professional educators would have been aghast at my irresponsible behavior. After all, I did not respond to my student's psychosocial needs and did not use my JP-4 in an optimal manner. But you should have seen those guys fly on their second, third, and subsequent rides. Once they realized that they had the stick, it was smooth sailing— there was no doubt in their blue aerospace minds that they were in charge.

These next two stories are things that have happened to me which taught me to take charge of my airplane:

Story nr 3. *Air Traffic Controllers Who Don't Control*. Mind you, I have nothing against air traffic control. I'm the lousiest instrument pilot that ever walked the face of the earth. When the weather gets bad, I need those people. Like anyone else, though, they make mistakes once in a while, and they freely admit that they don't have total control in every flying situation. Once, I was driving along to fill one of those annual approach squares on a VFR day under GCA control. On a long GCA downwind, I was vectored between two hills. Presently, at left 9 o'clock high, one mile, there was a mountain peak. At right 3 o'clock high, one mile, there was a mountain peak. A quick glance at my radar altimeter showed 200 feet. Another time, under IFR control at 27,000 feet, I looked out the window and saw four F-4s heading directly at me, co-altitude. My student didn't know what to do. He said later that he was thinking about being violated by ATC if he took evasive action. He didn't think about the ultimate violation at all. The point is, as much as I love those ATC folks, I don't trust them as far as I can throw them. Their scopes are no where near as good as my 20/20 peepers on a VMC day. For that reason, I avoid weather flying like the plague whenever possible. I use my radar and my eyeballs and don't believe a word they tell me until I can verify it myself. I just can't afford to let someone on the ground take my st away from me. It is not conducive longevity.

Story nr 4. *The Guy Who Flew Book Instead of His Airplane*. The was once an experienced fighter pi on his first European tour, and he was taking his first theater instrum check. He studied the rules, but being a standard fighter jock, he didn't remember them well enough He went on his checkride with a DRPCB SEFE who shall forever remain nameless and tried to remember all the rules while airborne. He failed miserably and flew the worst mission of his entire life. He flunked his checkride with about four million discrepancies. The irony is that if he had just use his common sense to fly his airpla instead of concentrating his entire attention to the nitpicking little rule he would have done well. I won't tell you who that experienced fight pilot was.

Here's one about a guy who wasn't afraid to speak out against a unacceptable situation:

Story nr 5. *The Horse Built By Air Force Committee*. There was once a multi-mission, multi-aircraf type of base which formed a committee to develop operating

edures for the airfield. Everyone there— fighter types, SAC types, types, air traffic controllers, members of the foreign host rnment. After about forty-eleven s of intense deliberation, edures were invented which dered every possible occurrence nuclear attack to an invasion of ets. Every procedure was locked ncrete— everyone knew exactly to do for every conceivable ion.

out two months after the edures were started, the wing one of those massive safety ings. The first item on the da was a giant diatribe from high mucky muck in the wing t how the guys weren't wing all the procedures and just ving up the whole operation. ly, one lone captain with a beak s face stood up and said: "Sir, whole big thing that you've got here is fine and good I ose, but my mission at this base t to follow your operating edures. My mission here is to bombs and to learn air-to-air re. I don't understand about of your procedures; I can't mber any of them, and even if I , they would cost me so much and gas that they would unacceptably cut into my mission. How about giving me some credit for a little bit of common sense and let me do my job? Right now, your procedures are simply not hacking the program."

Amid stunned silence, the courageous and articulate captain took his seat. All of the procedures were subsequently scrapped, and the base lived happily ever after, with the committee-built-horse-that-was-really-a-nasty-old-camel never coming around again.

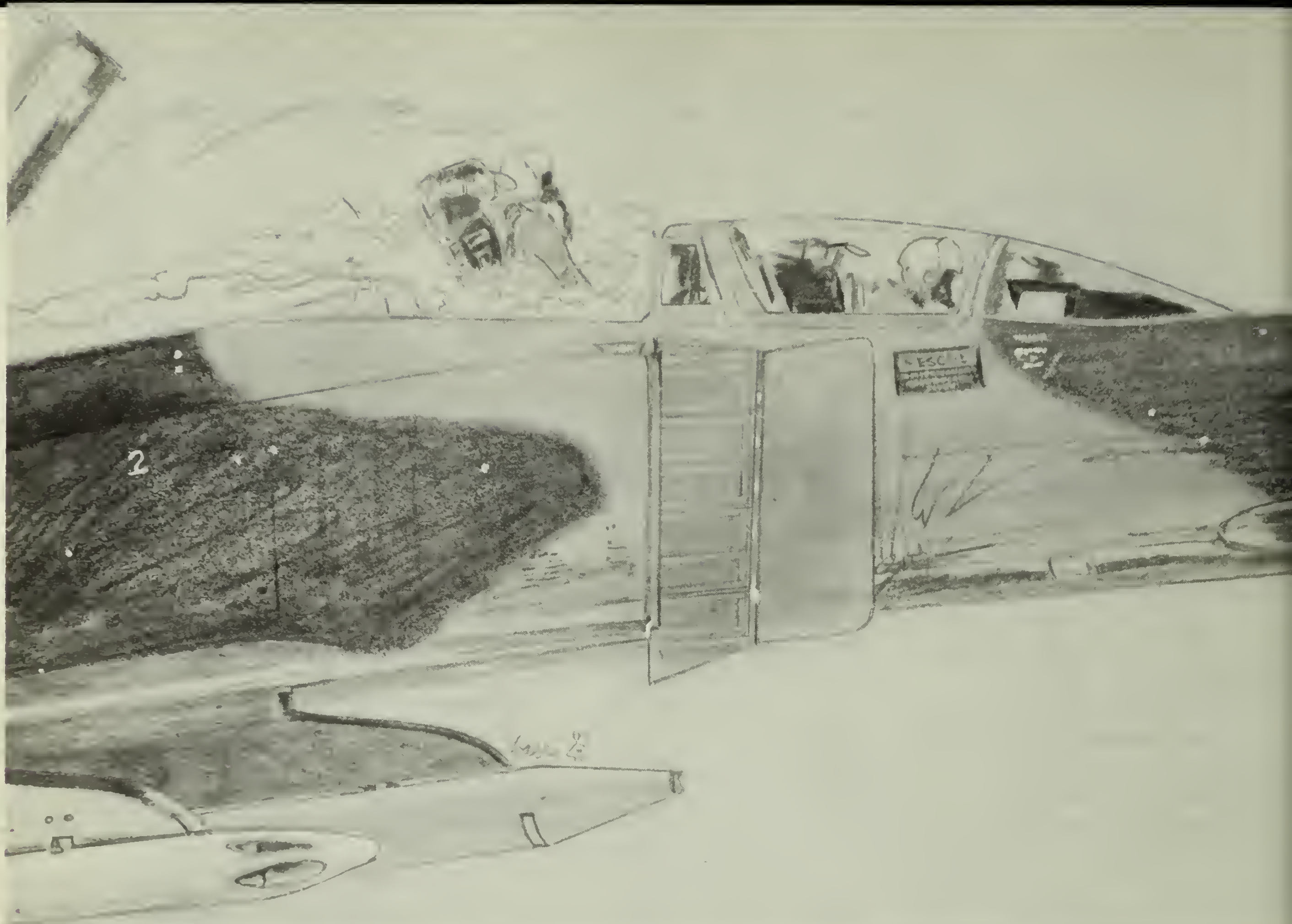
And, finally, here's a war story with a message:

Story nr 6. *The Flight Leader Who Led.* Once, when I was a new guy in combat, I was driving all over Southeast Asia one afternoon on the wing of a crusty old fighter pilot who had been my mentor for the first few missions. We were loaded up with snake and nape and nobody could seem to find any commies for us to kill. Afternoon turned to dusk, and then to dark. The leader took us over to squadron common and said: "Bear, you haven't had your night check yet, have you?"

"No, Sir," says I.

"Well, Bear, I guess you'll have to do without it— mind your p's and q's and don't bust your tail." We finally ended up in the middle of a giant firefight where the Army needed us pretty darn bad. I did OK. Afterwards, we were talking about the night checkout thing, and he said, "You've been flying on my wing now for a while; I think I know how well you fly. If I didn't think that you could have done the job, I would have sent you home. Those kind of decisions are exactly what I get my flight pay for." End of discussion. That was one of my first exposures to a guy who wasn't afraid to grab the stick.

The purpose behind all these little stories is simply to show one thing: It doesn't matter who you are, from a wing supervisor down to the lowliest brown bar, there are ample opportunities for you to take that stick. If we were to spend more time just latching on to that mother instead of worrying about who owns it, we would enjoy a better (and safer) Air Force. ■



MAJOR BRUCE N. COX • Directorate of Aerospace Safety

■ As a newly assigned project officer to AFISC, I haven't yet lost touch with the "real world" of squadron-level flying. My last flight was only a month ago, so I can hopefully still relate to the aviation community. But, my days are numbered, and I will soon be a higher headquarters weenie, unable to recognize the REAL Air Force. (Or so I'm told!) So I won't preach with high-level philosophy, just talk straight with you. My comments are directed primarily toward those aircrews who fly with escape systems in their aircraft, but don't stop reading just because you don't have an injection handle by your side. Next year you might.

There are few military aviators who have not personally grieved the loss of a friend in a flying accident. No one in our business is immune from this. When we are faced with this agonizing experience, our common profession compels us to second guess the mishap and the aircrew's role in it. I have done this on several occasions and probably you have too. To me, the most haunting memory of an accident is knowing that the crew could have saved their lives, but didn't. Tragic as this may sound, it happened more than once during 1979.

When an aircrew does not attempt ejection and is fatally injured, our aviation fraternalism inherently asks us to find a reason which removed the "aircrew error" stigma. There are times when personal injury or aircraft damage prevents ejection. Our fraternalism can accept that, because our hardware isn't perfect or failsafe. There are those nebulous times when ejection is not attempted beca the crew just doesn't recogniz the need to eject. Such would the case when unexpected ground collision occurs. We'v done that with alarming regula during 1979, too.

We agonize over that type accident, but our gut feel is th some unknown distraction or malfunction diverted the crew' attention from their "stick and rudder" duties. But the one ty of accident that we cannot ac is when an aircrew sticks with crippled aircraft to their death futile attempts to save the machine. This has never set with me.

More than 30 years ago, we installed ejection systems in o aircraft to give the fliers the

The Will To Leave

Equals the will to live in an ejection decision

ortunity to smartly exit a med aircraft *before* it made its l landing. Now, it doesn't take ocket scientist to know that the w has to decide when to make r escape and jettison the raft. I, personally, have never ed out of an aircraft, but I e talked to many who have. y agree on one point— the ision to pull the handle is e obvious. Why then do some rews override this decision stay with an aircraft until it is late?

he answer to this question haps relates to the aircrew's and inability to admit to mselves that they have made irreversible mistake. Aviators 't seem to hesitate when it nes to leaving an aircraft pled by a material failure of ne sort. But it's a different story if the aircrew themselves place the aircraft in the doomed category. This is where the crew is forced to make a critical choice. Our pride says, "If I put the aircraft there, I can get it out!" We've all experienced this to some degree, whether it be on the range or in the landing pattern. We've salvaged a mistake and come home to tell about it. But we continue to lose aircrews while they attempt to salvage their mistakes and, in the process, lose track of when it's time to junk the airplane and save themselves.

I've seen aircrews sit around a beer keg on Friday night and argue about when it's time to leave the aircraft. We need this kind of discussion among our crews. The point is, the time to think about ejection is before the fact. The cockpit gets awfully busy when something goes wrong, and that isn't the time to analyze your personal ejection parameters. The time to chose your personal ejection parameters of altitude and aircraft airworthiness is *before* you leave the squadron building. You must then have the discipline to leave the aircraft if it turns into a pumpkin and you reach those parameters.

It is far better to be alive and be briefly thought of as a "whiskey delta," than to kill yourself and remove all doubts. You owe it to yourself and your loved ones to think about that!! ■

With The Wheels Up or
(It Sure Takes A Lot Of Power To Taxi)

MAJOR DAVID V. FROEHLICH · Directorate of Aerospace Safety

■ THE SCENE: A large conference room somewhere in the Pentagon. All you can see are stars and blue suits (and frustrated smokers because it's a "conference room"). This is a gathering of high-ranking USAF officials to solve the problems dealing with the recent rash of unintentional gear-up landings. A hush (more-or-less) falls over the room as the last few dignitaries arrive so as to begin the briefing. We now turn to our live, on-the-spot reporter, Captain Cynic, for his totally unbiased report on the proceedings.

CAPTAIN CYNIC: "Viewers, the scene is set and Major Rough Briefer is about to begin his presentation. Let's listen."

MAJOR BRIEFER: "Ladies and gentlemen (and aircrews), I'm Major Briefer with a short presentation on unintentional gear-up landings in USAF operations. During 1979 the USAF recorded six unintentional gear-up landings resulting in a total damage cost of approximately $643,641. This may not seem like a large amount, but the loss of airframes and resources puts a dent in our capability which we cannot afford. Already in 1980 we have experienced one gear-up landing resulting in minor damage to the aircraft. Today we'd like to analyze some of the possible common denominators in the mishaps, attempt to pin down a common thread and discuss some alternatives to reduce or eliminate gear-up landings. But first, let's take a 15 minute break."

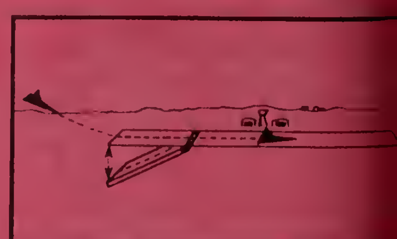
CAPTAIN CYNIC: "Wow, what a power-packed opening! We had expected this to be a biggee, but had no idea . . . wait, here's the major, ready to start again."

MAJOR BRIEFER: "Thanks for coming back, folks! We'd like to start with a discussion of some of the possible factors which the six 1979 gear-up mishaps did or did not have in common. How about aircraft type? No, we have to rule that out because the six in 1979 consisted of two transport types, two fighter types and two trainer types. Crew—no, can't lean on that either 'cause there were three crews and three individuals in the six mishaps. Two single-engine machines and four multi-engine aircraft, so no common thread there either! Maybe aircrew experience? We have to drop that also—they were highly qualified, high-time folks and brand newbees!"

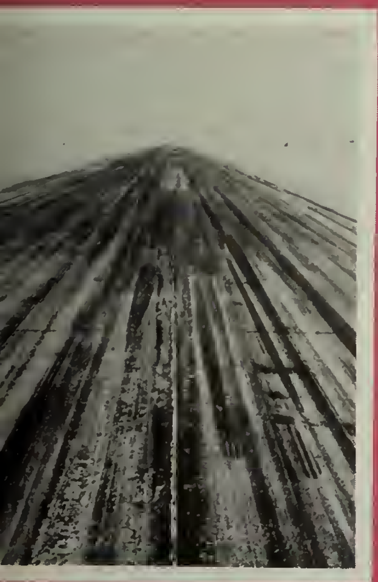
GENERAL OVERALL: "Get on with it, major. Is there anything in common among all six mishaps?"

MAJOR BRIEFER: "Yes, sir! I h[...] to dig into the reports and read the[...] detailed narratives, but the commo[...] denominator is 'distraction'. In all [...] cases there was an event or seque[...] of events which either broke or fix[...] the operator's concentration and allowed them to land gear-up. The distractions include other inflight traffic, ground aircraft movements[...] inflight emergencies or equipment problems, etc."

The above fictitious conference never happened but very well cou[...] have! The numbers are correct an[...] the bottom line is the same: distraction is the culprit! But, how [...] we work the problem?



Nuclear Powered Runway Threshold Lowering Device?



"What's that, tower? I can't hear you 'cause the damn horn's blowing in my ear!"

Veld the Wheels Down. We have er had a T-41C land with the gear acted! If we took the welded-n theory around for coordination, would probably get "we cur" from the Arab oil companies reased fuel consumption) and the iets (can you imagine the Eagles Phantoms hassling with the ers down?).

rop Away Runway. We could d a nuclear powered, laser ored, computer scheduled, stically activated, hydraulically ated runway lowering device! diagram) This contraption would at the airplane on final, check he wheels and rapidly lower the 1,000 feet of runway to give the operator one last shot at lowering the landing gear.

Seriously, we can try to add systems and extra observers and ways to remind the pilot, but the only cure to scraped aircraft bottoms is operator awareness. Checklists have to be run, lights have to be rechecked, horns have to be noticed! That is over-simplistic, but operators have to begin to set for a mental warning whenever a distraction interrupts normal processes. For instance, try to condition to recheck for three green lights at minimums on every approach. If anything odd-ball happens in the instrument or visual pattern, try to get in the habit of saying "Where are my wheels?" If you are in a supervisory or instructor position, work on your students to get out of the "automatic gear-check" habit. Make sure they look at those little green lights as they check the gear.

Ours is not the only group with the problem! FAA Advisory Circular 20-34C discusses the same type of problems in the civilian retractables. In one recent year, almost one-third of the light aircraft human factor landing gear mishaps were chalked up to "neglected to lower landing gear." The circular advises pilots on completing the landing gear checklist and knowing the gear system thoroughly. Sounds like pretty good advice, but again — our problem does not appear to be lack of checklists or knowledge. The weak link is distraction!! Something interrupts the sequence, checklist or routine and the belly gets scraped! Get it together so they don't write one of these about you!

OPERATIONS FACTOR, Pilot Error. A non-standard downwind was established from a crosswind turn. Preoccupation with non-standard pattern and traffic precluded accomplishment of normal configuration procedures (CAUSE). Pilot punched off the gear warning horn on downwind (CAUSE). Gear was not confirmed down by either FP or IP during turn to final as required by radio transmission or crew checklist procedures (CAUSE)."

"OPERATIONS FACTOR, Aircrew error. The crewmembers, pre-occupied with an imagined emergency allowed their attention to be diverted from basic flying tasks. The crew failed to insure the landing gear was down IAW T.O. . . ."

"OPERATIONS FACTOR, Crew Error. The crew was distracted and failed to insure . . ."

MAJOR BRIEFER: "Gentlemen, this concludes my briefing."

"What's that, tower? I can't hear you 'cause the damn horn's blowing in my ear!" ■

MOUNTAIN WAVES

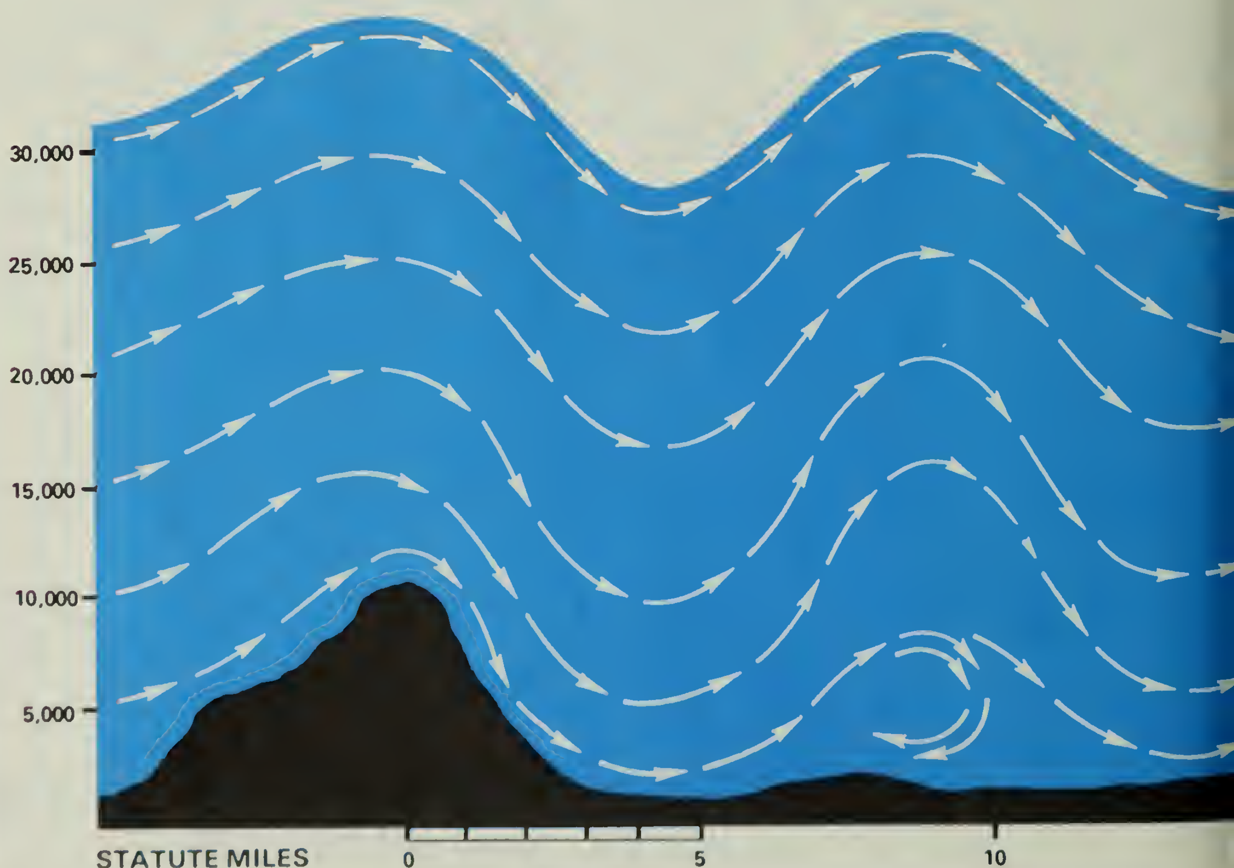
A Force Second Only

■ The meteorological phenomenon referred to as orographic mountain turbulence, lee or gravity waves—but better known as mountain waves—is as old as meteorology itself. It is the phenomenon which occurs under certain conditions when air flow is directed toward a mountain range or rough terrain, producing a stationary area for 10 or more miles to the lee side of the range, possessing extreme turbulence and very high velocity updrafts and downdrafts.[1]

Characteristics of a typical mountain wave are illustrated in figure 1, pictorially describing the sequence of development. As depicted, the air flows smoothly with a lifting component as it moves along the windward side of the mountain. The wind increases in velocity, producing a venturi effect, and upon passing the crest the flow breaks down similar to the airflow over a stalled airfoil.[2] As the breakdown occurs, a much more complicated pattern develops with downdrafts predominating a companied by associated updra and turbulence. Proceeding downwi for perhaps 5 to 10 miles from t summit, the airflow begins to asce as part of a definite wave pattern.

Additional waves, generally l intense than the primary wave, a may be downwind. "In some are as many as six and even more ha been reported, resembling the ser of ripples which form downstre from a rock submerged in a fast mo

Figure 1. Typical Mountain Wave Pattern



To Tornados

LTC JAMES D. SIMPSON • U.S. Marine Corps (Retired)

ıg stream."[3]

The first wave, because of its more ıtense action and closer proximity to ıe mountain, is of primary concern. The horizontal distance between ıccessive waves usually ranges om 2 to 10 miles depending upon e existing wind speed and atmos-ıeric stability, but wave lengths) to 20 miles have been reported."[3]

While there is still much to be arned, we know that "the turbulence ızard in mountain waves is of a agnitude compared with, and maybe eater than, that involved in pene-ıting a thunderstorm. Estimates are ıt accelerations of as much as 8 G more could be experienced."[4]

Sailplane pilots long have been tak-ġ advantage of the rising air cur-ıts on the windward side of a moun-n and have greatly contributed to-ırd a better understanding of the ountain wave. During the 1930s, ese sailplane pilots observed that ong currents which rose to great ights occasionally were encountered the lee side of a mountain. In the ıke of this discovery, record ghts of more than 30,000 feet were orded by using these strong cur-ıts on the lee side of the Alps. In 52, near Bishop, CA, a new record 44,500 feet was established using mountain wave on the lee side of Sierra Nevada Mountains during eriod of strong wave activity.[3] jave, CA, was the site of the cur-t record which is 46,266 feet re-ded in February 1961.[5]

The strong currents that rise from lee side of mountains continue to oduce record breaking flights, 'horizontally as well as vertically. As of May 1977 the distance record was established at 1,015.8 statute miles requiring an elapsed time of 14 hours and 3 minutes along the Appalachian and Clinch Mountain ranges.[6]

When mountain waves are discussed, mountains of great heights such as the Sierra Nevadas, the Great Divide and the Alps come to mind. However, it has been established that any mountain range or ridge line with a crest of 300 feet or higher is capable of producing wave phenomena. These phenomena have occurred at altitudes up to 75,000 feet over a roll of hills only several hundred feet high.

A wave condition arises with a component of the wind at a speed of 25 knots or more at the mountaintop level flowing perpendicular to the mountain range. "The actual wind direction can vary somewhat (with 50 degrees being the maximum deviation from the perpendicular) and still cause a wave, but the strongest waves occur with a strong perpendicular flow. The stronger the flow, the more severe the effects to be expected on the leeward side."[4]

In the western United States where these waves have been observed most frequently, it has been noticed that the strongest waves develop when there is a cold front approaching the mountains from the northwest and/or a trough aloft approaching from the west. This produces a strong westerly flow over the mountain ranges which have a north-south orientation.

There is generally a stable layer or inversion present on the windward side of the range up to an altitude slightly above the peaks, with a strong wave. A prefrontal area usually includes this condition. The top of this stable layer is just above the cap cloud and dips to its lowest level at a point directly over the foot of the roll cloud. Without this stable layer, convective instability tends to break up the wave pattern.

The most favorable wind profile for the existence of a high wave has winds exceeding 25 knots at the mountaintop level. There should be a rapid increase in the wind speed with altitude in the level of the mountain range and for several thousand feet above, with a steady strong flow up to the tropopause. The character of the wave varies with different wind profiles. A very strong increase of wind with height can eliminate the wave leaving only stagnant air in the valley.[4]

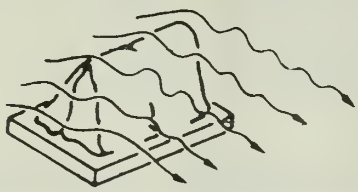
As would be expected, the mountain profile has a pronounced effect on the character of a mountain wave. Several topographical variations and their effects on the airstream are depicted in figure 2.

The most notable variations are:

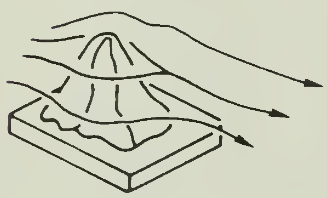
- Waves will be stronger to the lee of the ridges than to the lee of isolated peaks. They will extend higher and will carry a greater distance downwind (figure 2a).
- A concave shape toward the oncoming airstream is more favorable for waves than a convex shape (figure 2b).
- Ridges with gentle windward slopes leading to steep lee escarp-

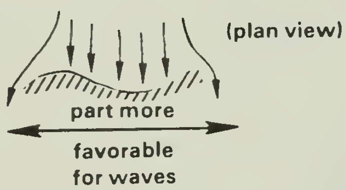
Mountain Waves continued

Figure 2. Effects of Topography

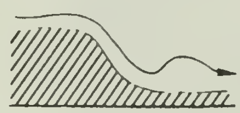


a. INFLUENCE OF LENGTH OF MOUNTAIN.





b. INFLUENCE OF CURVATURE AT CREST LINE.



c. INFLUENCE OF GENTLE WINDWARD SLOPE AND STEEP LEE ESCARPMENT.

d. INFLUENCE OF A MOUNTAIN PASS.

ments are particularly favorable for strong wave activity (figure 2c).

- The lee of a pass between two prominent peaks is a favorable area for wave activity (Figure 2d).[7]

The telltale signs. The possibility exists for wave phenomena to develop when the air is too dry to produce any telltale signs. However, this condition is relatively rare and cloud formations remain the best means for identifying the presence of a wave before encountering it. Some typical cloud formations normally associated with the wave which will be discussed in detail are the cap cloud, rotor cloud, lenticular cloud, and in some regions the mother-of-pearl cloud. The clouds and their associated position in the mountain wave airflow pattern are depicted in figure 3.

A cap cloud, as the name implies, is a low hanging cloud with its base near or below the mountain's summit and a relatively smooth top only a few thousand feet above the summit. The major portion of this cloud is found on the windward slope where it usually releases light rain or snow. The leeward edge remains stationary, as an apparent wall when viewed from downwind, with fibrous fingers reaching part way down the lee slope before dissipating. At times, the cap cloud will appear to roll over the ridge line and then down the lee slope very much like a waterfall. From downwind, it often resembles a stationary bank of stringy cirrus.

The rotor cloud, which looks like a line of cumulus or fracto-cumulus clouds parallel to the ridge line, forms on the lee side with its base at times below the mountain peaks and its top extending considerably above the peaks, sometimes to twice the height of the highest peak. "The rotor cloud may extend to a height where it merges with the lenticulars above, extending solidly to the tropopause."[4] Like the funnel of a tornado, this cloud gives visible evidence of vio turbulence.

The most dangerous features mountain waves are the turbulenc and below the rotor clouds and downdrafts just to the lee of the mo tain ridges, and to the lee of the r clouds.

During investigations of the Bis Wave, horizontal as well as ver gusts of 2 G to 4 G were recorded 7 G was exceeded on one occas Downdrafts and updrafts on order of 2,000 feet per minute v observed, with other instances mated as high as 3,000 feet per r ute.[7]

The rotor, a standing cloud, is c tinually forming on the windw side and dissipating on the lee s Although its rotation is seldom vis from the air, this cloud is actu rotating forward toward the moun in its upper portion and backwar its lower portion.

The lenticular or lens-shaped clou which appear in layers between 20, to 40,000 feet are relatively smo and the most spectacular of all forms identifying the presence the wave. The layers or tiered app ance of these clouds is consistent the smooth laminar flow in this tion of the wave. "The tiered t structure is due to the stratified c acteristic of humidity in the atm phere and the lifting effect of wave on the whole depth of the atm phere."[7] These lenticular clou like the rotor, are stationary, c stantly forming in bands paralle the mountain at fairly regular spa intervals on the windward side dissipating to the lee.

As many as 10 bands have b observed at one time, extending ou or more miles to the lee of the mo tain ridge. At other times, only lenticular might be visible in the of the most prominent mountain struction.[3]

At times, severe turbulence r

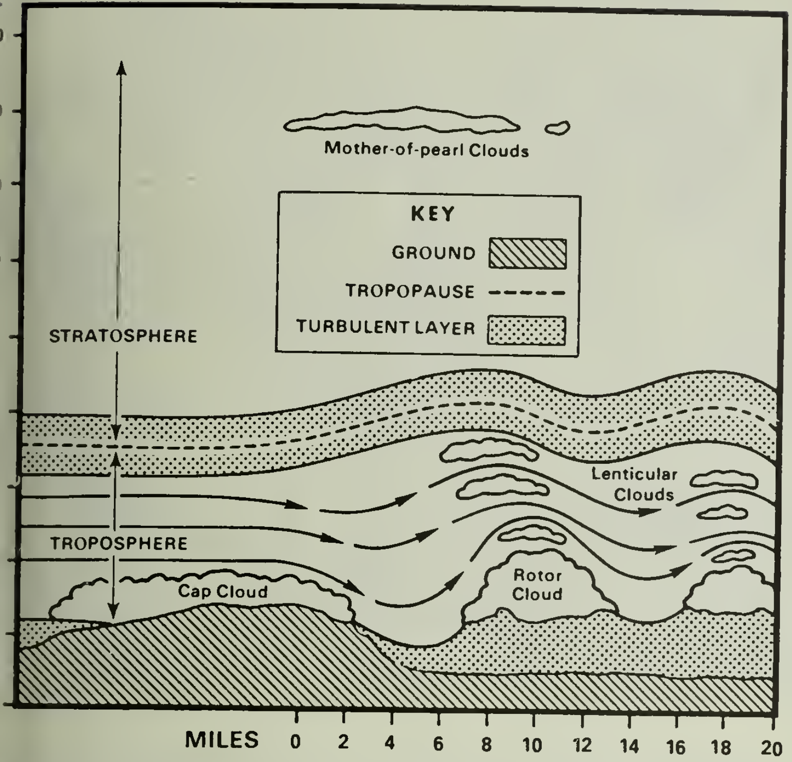


Figure 3. Typical Mountain Wave and Associated Clouds

above the extremely smooth ulars. "The turbulence layers and below the lenticular level mparable to ball bearings, allow-e atmosphere between to flow h at very high speeds."[4] For s not well understood, at times is a sudden breakdown from h wave flow into vigorous ence which occurs throughout rtical extent of the wave system. this happens, the highest lar clouds reveal very jagged, ar edges rather than the normal, h edges. In most cases, the tilt toward the mountain range ent is made through the layers the rotor cloud to the highest lar layers. As a consequence s tilting, the streamlines are l closer together in the down-side of the rotor. Thus, the peed is considerably increased area and local jets form, intro-additional hazards.

other-of-pearl clouds are high about 80,000 feet, lenticular and have been observed only Polar regions."[7]

While the overall context of the cloud formation is stationary over a considerable period of time, the clouds can change position, shape and structure in an extremely short time, and there is continuously a considerable amount of motion in and around the clouds. Extensive clouds can form or dissipate in a matter of seconds.

There are times when the wind is favorable for a wave condition, but there is not enough moisture present for the clouds to form. This cloudless or "dry wave" generates just as much turbulence as when clouds are present, but none of the warning features that the clouds provide are present. The conditions that are favorable for this type of wave phenomena and accepted as an indication of such a development are:

- Wind flow at mountaintop level of 25 or more knots perpendicular to the ridge.
- An increase in wind speed with altitude up to and above the mountaintop, in some cases on up to the tropopause. Within limits, wave action becomes more intense and stronger winds (more than 100 knots in the free air above the ridge) may eliminate smooth wave flow patterns entirely. When this happens, severe and chaotic turbulence may be expected.
- An inversion or stable layer (increase in temperature with altitude somewhere below 14,000 feet).[3]

The Wave. The amplitude or dimensions of the lee wave can be tremendous depending in a complex way on both the topography and the airstream characteristics. "In the Sierra Nevadas, for example, the wave clouds can extend several hundred miles parallel to the ridge lines of a well defined leading edge of clouds."[4]

There may be several wave crests or there may be only one. The amplitude and intensity of the waves decrease as they progress downwind. The distance of the first wave crest from the mountain peaks varies with wind speed, the type of wind profile, and the lapsed rate. "The crest of the first lee wave downstream of the ridge line is commonly observed to be less than one wavelength away."[7] With regard to wavelengths, observational evidence indicates that they range from 3 to 15 nautical miles, with the average about 6 nautical miles.

Although amplitude of lee waves is of importance, the larger the amplitude the greater the vertical currents, no operational techniques are available to assist a forecaster in predicting amplitude. Generally speaking, maximum amplitude is associated with the layer of greatest stability. The length of the wave has nothing to do with the turbulence associated with the rotor cloud.

With regard to persistence of mountain waves, W. B. Beckwith points out that "once established, wave activity may last for periods ranging from a few hours to 1 or 2 days with the essential characteristics of the waves remaining fixed in space."[8]

One mountain wave project was to investigate the altimeter error associated with the low pressure caused

continued on page 26

10% STARK TERROR

CAPTAIN ROBERT C. COPENHAFER, JR. • Davis-Monthan AFB, AZ

■ You've heard flying described as 90 percent boredom followed by 10 percent stark terror. To me, it was more like a 99 to 1 ratio with my one missing. You see, in my seven years of flying, I had not had anything really dangerous happen like what I am about to tell you. Everybody else had a good old heart pounding war story to tell except me. I had even felt cheated; but, no more.

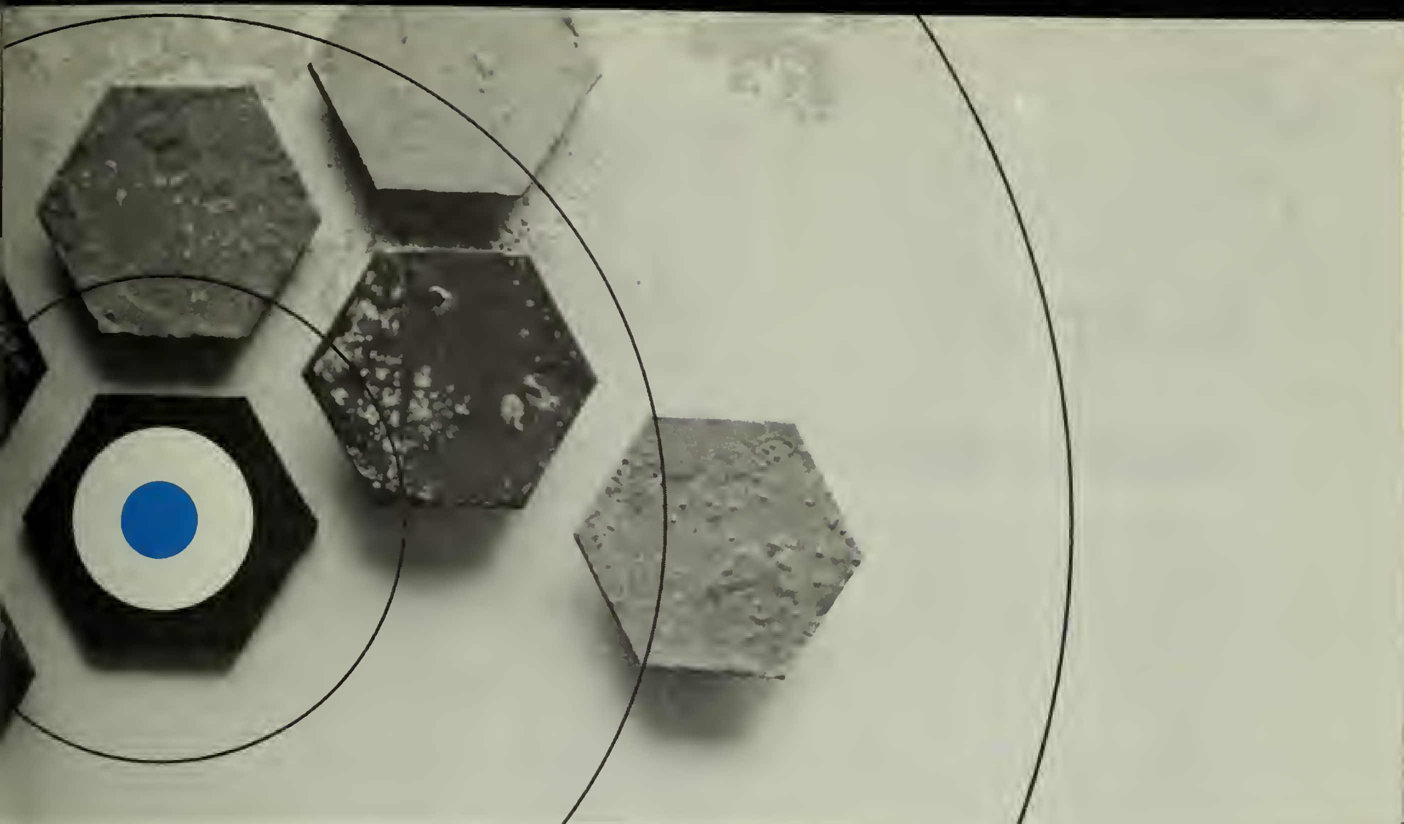
I was on a crosscountry flight in my *Duck* (0-2A) going from northern California to a base in southern California on a beautiful autumn afternoon. I decided to follow the California coastline while maintaining 1,500 to 2,000 ft AGL. The weather was as beautiful as the scenery. And, if I thought the scenery was beautiful, only God knows how many others thought the same, so the eyeballs were alert and searching the skies. Finally I reached the Los Angeles TCA. Having studied the approach plates and maps for the area, I noticed that VFR flight was restricted to 7,000 ft and above over the TCA. Complying with regulation, I climbed to 7,500 ft as I headed east over the city. I happened to see the LA Coliseum while tuning the ADF to the football game being played inside. Having never seen it from the air before, I decided to fly overhead for a few minutes while constantly searching the skies for *the blimp*. As the crowd filtered out, I decided that it was time for me to continue on to my destination. Up to this time, I was strictly VFR with no problems encountered and eyeballs tirelessly scanning the crowded California skies.

Contacting approach, I requested an ILS to a nearby airport for a low approach followed by radar vectors to my final destination. Approach cleared me out of 7,500 ft for 3,500 ft, gave me a heading to intercept the ILS final approach course, and told me the weather was VFR with five miles visibility. Five miles visibility in the Los Angeles Basin at 1600 local? Right! That dark, milky haze must have been measured with a mileage marker uncalibrated on the high side! However, this alerted me all the more to constantly clear and, believe me, I did clear as I had never seen so many different aircraft in one area in my life.

On the vector to the ILS fina ILS receiver did the expected b going inoperative. I notified approach control who instructe to maintain VFR at 3,500 ft, proceed direct to a nearby VO and fly a 100° heading upon reaching the VOR. I said to m "they really can't be serious thinking this visibility is actua VFR, but by the strict definiti VFR, they're right." It certai wasn't the VFR I was used to Arizona.

Pressing on to the VOR and clearing like a bandit, I had th feeling that something was am but I couldn't put my finger o do know that I was never mor vigilant of others than then. A roughly three to five minutes a some communication problems approach, I arrived at the VOF began turning to my assigned heading when I heard another aircraft calling his position at t same VOR. I looked left and t glanced right to see a green an yellow tandem seater joining o right and then doing an "alley over the top and in front.

By now I was getting just a concerned. For three hours I h



ı, clearing for myself with no
from radar, and now with their
I was getting into what I felt
ın uneasy situation. Winding
lock after my encounter at the
, I continued on the 100°
ng for another five minutes or
ıen approach called out
hute activity at my 12 o'clock
vo miles and simultaneously
me a vector to 110 degrees.
ing through the darkening haze,
le contact on four to five
ers at my 11 o'clock low
nding over a small airport. I
d the aircraft to search for
jumpers in that direction
N . . .
at happened next is the most
ening experience I've ever had
life. Rolling wings level, I
parachutist at my 12 o'clock
ly climbing his risers with his
above his chin desperately
to get out of the way of my
aster which was about ready to
im! How close? Well, let's say
l a yellow helmet on, a
h brown mustache drooping
l the corners of his mouth,
was wide open displaying
rror of the situation, and two
widest eyes I've ever seen

on a human being. Immediately, I dumped the nose and pulled left checking my 3 o'clock only to see a horde of jumpers with their rears to me climbing their risers as well. I could not believe what had almost happened as I notified PAR final control.

Walking into Base Ops, I was amazed how such an enjoyable flight could turn into such a horror show in a matter of minutes. Had I done anything wrong to deserve such fate? I had seen the notice of parachute activity near my final destination in the IFR Supplement. But, tell me, who really pays close attention to the IFR Supplement after confirming that the field is not PPR or that it has the proper gas and oxygen and sufficient runway? Complacency? Not a chance! Like I said before, I was prone to the clear position. Controller at fault maybe? Well, parachutists don't give radar returns as far as I know. Parachutists's fault? Check your right of way rules.

It dawned upon me that I nearly killed someone with me being at fault even though I did things by the book. Or did I? Maybe I should have asked approach if there was any parachute activity in the area mentioned in the IFR Supplement. But, on the other side of the coin, why wasn't I told sooner or, for that matter, what are people doing parachuting in an approach corridor to a major airport?

I've rehashed this nightmare over and over again for the past week looking for ways to avoid such an occurrence again. I can tell you that from now on, this pilot is going to continue to clear like my life depended on it (I know it does), pay close attention to all the remarks in the IFR Supplement, and if any doubt exists as to unusual activity enroute or at my destination, I will initiate the inquiry and not wait to be called. Those few minutes of a three hour and thirty minute flight are all I can really remember. Stark terror makes a lasting impression while yielding unwanted war stories. Hopefully, you won't be able to use the same story. ■

I Learnt Ab

PART II

■ Last month I told you about our flight outbound from the United States to the Azores. Well after a two week ''swan'' around the Med we found ourselves back at Lajes preparing for the flight home. We had lost one aircraft due to a heavy landing at Naples – the wheels went through the wings and it blew up on touchdown, but that's another story – so we were down to 15 aircraft for the return journey. Because of the prevailing winds an extra stop was planned at Bermuda, which was fine by us as we had missed a stop there on the way out!

We planned to fly back as a five aircraft formation, meeting the tankers 400 miles west of the Azores, and to complete the remaining 1,300 miles unaccompanied. Once again navigation was to be by DR.

On the morning we were due to leave the satellite picture showed an extensive bank of cloud around the refueling area, and the pilot of a C-141 who had just come through it advised us not to bother. We didn't! The next day the cloud had cleared from the refueling area and we decided to have a go.

We joined up with our tankers as planned and plugged in. There were five of them – one each – in a stepped down echelon. As we approached the end of the refueling bracket, I looked down at nr 5, my wingman, who was at the bottom of the stack and saw him being engulfed slowly but surely by a thick layer of cloud creeping up from below. Very soon I could see his tanker but I could no longer see him on the end of the hose. Rather than go IMC, we disengaged early and tried to join up. In a Phantom with three full jugs at 220 knots at 20,000 ft you're on the wrong side of the drag curve, and until you get climbing speed, there's no place to go but down. Initially we used reheat to try to stay on top of th
worst of it and get joined up.
However, we were not that flush
with fuel, and the cloud tops got
higher. Numbers 1, 2 and 3
managed to get joined up with th
aid of the only serviceable AI in
formation, but I (nr 4) and my
wingman (nr 5) were eventually
forced to dive to achieve climbi
speed. Then we had to continue

ng From That

**'his is the second
:wo articles in
ich a Royal Air
'ce pilot tells of
experience and
ne of the pitfalls
t may await
crews over the
l-Atlantic.**

letons. We maintained heading leveled at different heights — k goodness our radios were king well for a change! We tried limb out of the cloud but itually had to give up as by this the tops were well above)00 ft and we were still heavy fuel.

short time later my wingman ly informed me that his pass was suspect and that he had lost all attitude information. However, he said he could see a contrail through the cloud above him, which he thought was mine, and that he would follow it. That sounded like a reasonable idea and he followed it for 300 miles!

Suddenly, and much to our relief, we broke into the clear, and my wingman joined up with me. Although we had all been flying the same heading, an Air-to-Air TACAN check showed that the other three aircraft were 64 miles to the south of us. At that point we noticed a large contrail close by and eventually found a friendly C-141 on the end of it going roughly in our direction. It seemed like a good opportunity to find out where we were — apart from knowing that we were approximately in the middle of the ''pond'' — so we gave him a call. Out there 243.0 was all ours, and the captain seemed to find nothing unusual in having five Phantoms asking for directions to Bermuda. He wasn't actually going there himself, but I was inclined to take the heading he gave us as a reasonably good steer. After all, in that situation how selective can you afford to be? An hour-and-a half later Bermuda TACAN indicated on the nose and we arrived in the kind of sunshine one expects out there.

On arrival we heard that the next wave of five aircraft had failed to join up with their tankers and had returned to the Azores. One pilot had had a fuel transfer problem and flamed-out ½ mile off the approach end of Lajes runway!

We all learnt a lot about flying and air-to-air refueling planning on that detachment.

— Courtesy *Air Clues,* November 1979. ■

Anatomy of an Accident

CAPTAIN GLENN SUTHERLAND
80 FTW
Sheppard AFB, TX

■ Student: "Solo 10, initial."

RSU: "Winds calm."

This was to be this student's third pattern in an otherwise routine second solo mission in a T-38.

The student pitches-out, configures with gear, and is displaced for a normal overhead

The student now commits the final and fatal error. He rolls into 45-50° of bank and starts the nose up as he moves the throttle forward.

pattern.

"Solo 10, gear down."

This was the student's first chance to prevent the coming accident, but the gear down call had become just another radio call – he does not check, and does not realize that the flaps are not down.

To himself: *My airspeed is high and I seem to be losing a lot of altitude – pull off some more power and pull the nose up.*

The student has now missed his second chance at preventing this accident. Once again he is mechanically flying the aircraft and fails to analyze the reason for his high airspeed and descent rate. The corrections he made are both totally wrong.

Looks like I am going to overshoot. I sure hope the center runway is clear.

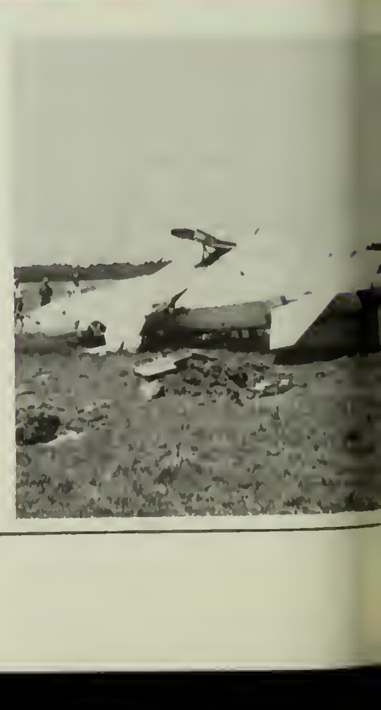
RSU: "Center's clear."

Student: "Thank you, on the go."

The student now commits the final and fatal error. He rolls into 45-50° of bank and starts the nose up as he moves the throttles forward. At that altitude and with that configuration the aircraft simply does not have enough power to overcome the drag and stop the sink rate in time.

RSU: "And let's get that thing flying. Burners, please."

The student did not acknowledge the call and approximately three seconds later the aircraft crashed. The configuration at the moment of



ct was gear down, speed brakes
nd flaps up. The aircraft
cted the ground in 40-50° of
, 8-10° nose up pitch, throttles
e afterburner range and full aft
. The student made no attempt
ect and was killed upon impact.
l systems were operating
ally prior to impact, so the
ns for this accident had to be
1) The student failed to lower
and (2) maintained bank and
ed a high descent rate to
op. In short: pilot error.
ny pilots will argue that knowledge of aerodynamics is not necessary to adequately fly the machine, and this is partially true. However, without knowing why we do the things we do in an airplane, we are just over-paid assembly line fliers. We are simply pulling and pushing knobs and controls, just mechanically performing our given task, all the while attributing the performance of our aircraft to wires, mirrors and magic.

This student might be alive today if he had not made the fatal mistake during the go-around of increasing bank and back pressure *before* increasing power. At this point, he was trying to accelerate with the brakes on. At the time of impact it was estimated that the aircraft was in a descent rate of 10,000 fpm or 166.7 fps.

There are many questions that remain to be answered: Why did he fail to lower the flaps?

Why did he fail to properly check his configuration during the turn?

Why did he not recognize the bad pattern earlier and go around?

And, most of all, why did he increase bank and back pressure at that fatal moment during the go-around?

The answer to most, if not all, of these may lie in his training. Bad habit patterns may have been ingrained and when he reacted under stress, he unconsciously reverted to these patterns, which, in this case, proved to be fatal.

Instructors, this is why it is so vitally important that your students understand *why* they are taught to fly the way they are. A better understanding of the effects of power, bank, induced drag and angle of attack may prevent this type of accident from happening in the future. ■

MOUNTAIN WAVES continued

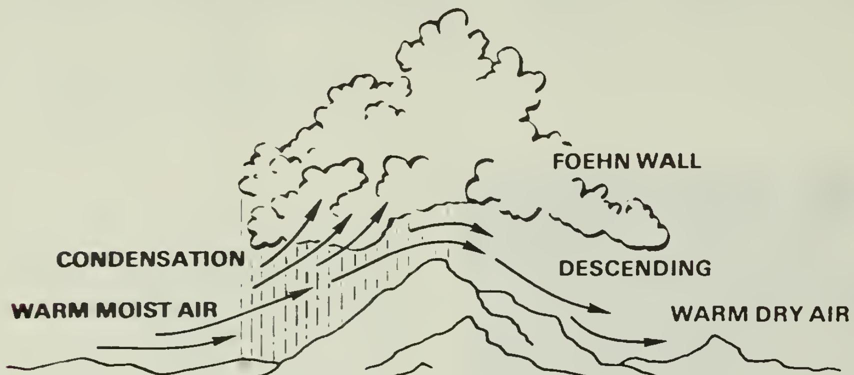


Figure 4. The Foehn or Chinook Wind

by the venturi effect of high wind over an obstruction. The pilot involved in the project who had occasion to make ski landings on the eastern side of the Sierras reports, "Near the tops of these mountains, after landing at points of known elevation, the altimeter has read as much as 2,500 feet high if a strong wave is in progress."[2]

Another type of mountain wave phenomenon worthy of discussion is the Foehn or Chinook winds. This same type of wave possesses numerous aliases in respect to its worldwide origin.

Snow eaters. One of the most interesting of local winds is the Foehn which was first observed and studied in the Alps. It is a warm, dry wind which descends the slopes and valleys of the mountains. Foehns which occur on the Great Plains of North America as well as those which occur in the interior valleys are given the name Chinook, an Indian term, which translates as "snow-eater." The cause of their warmth and dryness is shown in figure 4, but the essential features are:

A considerable elevation of land lying between an area of high pressure and an area of low pressure and sufficient water vapor in the air moving up the slope to cause precipitation on the windward side.[9]

Through adiabatic compression this wind is able to obtain increased temperatures and as this occurs, the relative humidity is lowered. The descending wind arrives at the bottom of the lee side of the mountain containing temperature rises as much as 50 degrees Fahrenheit. Blowing across a snowfield, they can evaporate snow at the rate of 2 feet a day.

During the descent, a great deal of turbulence and mixing of air masses occurs as well as the increased temperatures making this phenomenon a hazard comparable to the previously discussed mountain wave. Because there are fewer telltale signs, it is possibly more hazardous.

The knowledge gap. It is alarmingly obvious that there is not enough awareness about mountain waves and what their destructive forces are capable of doing. These forces, according to knowledge gained through extensive study, are said to be second only to tornados. Aircraft known to have the structural strength to withstand 14 G have been torn apart attempting to penetrate a fully developed mountain wave rotor cloud.

Contrary to many novices who claim to possess knowledge on the subject of mountain waves, these waves are not found only in those areas wl
towering mountain ranges occ
They also are found near mount
and ridge lines whose elevations
much less impressive. This phen
enon is capable of occurring in
region of the United States, or
other country for that matter, wl
the topography has ridges with el
tions of 300 feet or more. Ridge
this elevation have produced w
action up to 75,000 feet with as m
as 6 waves and a wave length o
miles.

The destructive force of moun
waves can be averted if one is fam
with the associated tell-tale si
The majority of times, this phen
enon says to those who are knowle
able, "Hey, here I am." With a g
weather briefing and a little sm
there is no need to fear, or to
caught in, a mountain wave. — Ada
from *U.S. Army Aviation Dig*
September 1979. ■

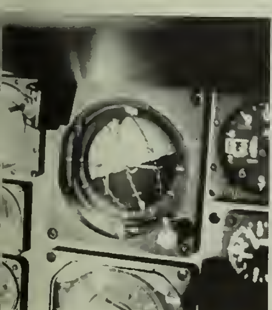
References

1. Joseph J. George, *Weather Forecasting for nautics*, p. 437.
2. "Beware the Mountain Wave," November *U.S. Army Aviation Digest*.
3. "The Mountain Wave," March 1957, *U.S. Aviation Digest*.
4. "Flying Weather in the Colorado Springs *Climatological Study SS967*.
5. Norris McWhirter and Rose McWhirter, *Gui Book of World Records*.
6. Karl Striedieck, "The Thousand Mile G *National Geographic*.
7. Philip A. Calagrese, "Forecasting Mou Waves," *Weather Bureau Technical Mem dum FOST-6*.
8. W. B. Beckwith, "Minimizing the Effects of tain Waves and Shear Generated Clea Turbulence in Airline Operations."
9. Clarence E. Koeppe and George C. De *Weather and Climate*.
10. Joseph S. Weisberg, Meteorology, *The Eart Its Weather*.

OPS topics

n The Gages

We hope there is not a
end beginning, but it
ems as if there has been
me less-than-good in-
rument flying. One of
ır action officers pointed
at out recently as follows:
We don't know what the
oblem is, but if you
ven't been under the
od recently, the next time
ur turn comes, work
rd, whether it be in a
nulator or in an aircraft.
we have learned anything
om our mishap reports—
d we have learned this
any times in the past—
e all of the instruments
of the time, use a normal
oss-check, and believe
at you're seeing unless
mething doesn't add up.
ly if you use all of them
n you tell if you've got a
d one. And falling off a
ng in weather is a ter-
le time to learn that you
ve gotten a little rusty
your basic instrument
ing."



Low Level Routes

When the crew of a T-37, flying a VFR low level route, saw an F-111 below them they rocked their wings to make the T-37 more conspicuous. They had to do it again a few moments later when they spotted another F-111 at or slightly above their altitude. The aircraft were never close enough to each other for a near midair collision, but the potential was there because VFR and IFR low level routes nearly coincided in one area. The VFR route has since been deactivated and the base indicated it would review all of its low level routes and redesign where necessary. How about your area?

A Soggy Day

Runway wet. The F-4E pilot planned accordingly and made a firm touchdown 700 feet down the runway. At 1,600 feet the left tire started sliding like soap, then the right tire—reverted rubber hydroplaning. Both tires blew, one at 2,400 feet from the end, the other at 3,100 feet. This crew was as slick as the runway and managed to bring the Phantom to a stop on the centerline. Everyone was a little puzzled when maintenance could find no reason for brake problems. The pilot probably felt a bit chagrined until on the fourth sortie following the blown tires, the left wheel locked up on touchdown on a dry runway. Six layers of cord later the tire started rotating again. Last we heard they were still looking for the culprit.

Everybody out!

During an alert response exercise on an B-52H, the flight crew noticed electrical sparks and smoke in the area of the pilot's sliding window. They shut down the engines and evacuated the aircraft. Investigation revealed that the flight crew had moved the metal "alert cocked" sign from the pilot's forward window to the side window. The sign subsequently slipped and fell against the pilot's sliding window heat switch. This caused an electrical short resulting in the sparks and smoke noticed by the flight crew. The unit now uses non-conductive plexiglass for their "alert cocked" signs.

Near Midair

A midair collision was averted when an alert controller called "traffic at one o'clock" and two pilots took immediate evasive action. The pilot of a T-38 said the other aircraft, a light plane, was behind the canopy bow and not visible to him. At the correct speed and angle, another aircraft may have no relative motion and thus could remain behind an obstacle such as a canopy bow. That has happened with fatal results. *See and avoid* requires more than just moving one's eyes. Move your head and body to be sure you see what's out there. ■

Mail & Miscellaneous

Send your ideas, comments and questions to: Editor, *Aerospace Safety* Magazine, Norton AFB, CA 92409

■ **Colonel William F. Belk, MC**
c/o Aerospace Safety Magazine

Colonel Belk

Your article on tonic water ("Gin and . . . Soda," Dec 79) and the recent attention devoted to tonic water has aroused a great deal of attention within the Air Force flying community. It has been a good example of essential information being rapidly disseminated through safety channels to all flying personnel.

The possibility of the quinine in tonic water causing undesirable side effects is now well known.

Conspicuous by its absence, however, is the relative lack of emphasis on the other ingredient of a gin and tonic. Namely—the alcohol in the gin.

While it is an immensely difficult problem to approach, someday, someone is going to have to address the problem of alcohol and military aviation.

How hypothetical it is of us to devote such a widespread effort about tonic water and the *very* minimal potential it has for safety; and at the same time ignore the gin which has a long standing and proven history of safety related mishaps.

I can't know of a single person in the Air Force who isn't aware of the problem alcohol presents to all types of safety including flying safety. The problem is that it involves virtually everyone, at one time or another, and we have grown to accept it.

Is there a single pilot anywhere within the military that has not seen, or indeed for that matter, personally participated in a mission while still under the effects, or aftereffects, of alcohol?

Isn't it about time that something be done about this problem; not only with flying personnel, but all personnel (driving, etc.). Your opening of the article highlights our own stupidity and apathy.

The effect of tonic water is minimal as compared to alcohol. Yet she served you the gin!

It is, of course, a matter of great individual and social significance. It involves qualities many Americans appear to have abandoned; self-restraint, personal responsibility and responsibility for our actions towards others.

Can we afford to continue to ignore the problem of alcohol? *It won't go away.*

Major Ernest J. LeClair, Jr., RI ANG
Hull, MA

Dear Major LeClair

Thanks for your letter. It may surprise you but the problem of alcohol in military aviation has been addressed–repeatedly so. This is not to say that it is no longer with us, but simply that the potential adverse effects of alcohol are well known. I doubt that there is a single responsible manager in the USAF who would condone flying while intoxicated. Yet, I'm equally sure that some individuals have and will fly in that condition.

I do not believe that we can simply expect Americans to exercise s[elf] restraint and personal responsibil[ity]. If this was a realistic expectation [for] mankind, there would be no need [for] police or, for that matter, milit[ary] forces. These are virtues to be sou[ght] in ourselves and honored in oth[ers] but not expected of all.

As part of society, it is the [duty] of each of us to take those actions [we] are capable of, which will help [en]sure the public safety and hea[lth]. The police and the courts can neit[her] stop drinking nor drunk driving, [but] if each individual assists those [ac]quaintances who have drunk too m[uch] and who are in need of transpo[rta]tion, we could drastically reduce [the] mayhem on the highway. Simila[rly], if anyone with knowledge of an [in]ebriated pilot, who is preparing [to] fly, advised management of this f[act] the public consequences could [be] prevented in virtually every case. [Un]fortunately, this expectation is [no] more realistic than the other.

What can we do? We can conti[nue] to publicize the hazards. We can c[on]tinue to develop rules and advise [our] crewmembers that we expect th[em] to utilize the necessary restraint [and] responsibility to live within the ru[les]. We can try to deglamorize alc[ohol] and its niche in the fighter pilot m[ys]tique. We can report truthfully [all] alcohol-involved mishaps. And, [we] can ask everyone to execute th[eir] responsibility for the public sa[fety] when all of the above fail. We [are] doing this.

Colonel William F. Belk, MC
Chief, Life Sciences Division
Directorate of Aerospace Safety

OPS TOPIC—TANGO IN TRAFFIC

1. Your August 1979 issue has just arrived, hence the delay. It's all good reading but I must take issue with the last sentence of "Tango in Traffic" on p. 24.

2. I'm an engineer but I don't think your jocks should relax only when they've "put the fire out." What about those ejection seat pins; the FOD hazards; the snags you've [al]most forgotten about because [you] didn't write them down in flig[ht]. No, sir, the time to relax is w[hen] you've handed the aircraft bac[k to] the line chief and you're in the c[rew] room again.

Flight Lieutenant L.E. Abbott
Royal Air Force

Amen!–Ed. ■

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STATES AIR FORCE

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...zardous situation

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...ant contribution

to the

... States Air Force

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Program.

MASTER SERGEANT

John B. Patterson

71st Aerospace Rescue and Recovery Squadron
Elmendorf Air Force Base, Alaska

■ On 9 July 1979, Sergeant Patterson was the flight mechanic aboard an HH-3E helicopter during a routine water hoist training mission. The initial smoke deployment had been completed when a rumble was heard and vibration was felt in the aircraft. The training maneuver was terminated, and the helicopter was vectored toward land. The nearest airfield was four miles away. While Sergeant Patterson was checking the rear cabin area, the aircraft was cleared for a straight-in approach. On final, strong electrical fumes were entering the cabin and cockpit. The number one generator failed, and an inflight emergency was declared with the tower. The smoke and flames were entering the cabin area from the rear of the main rotor gear box. Sergeant Patterson started fighting the fire with a small hand-held fire extinguisher. After landing and the engines were shut down, he climbed to the top of the aircraft and began to fight the fire from the maintenance platform while awaiting assistance from the base fire trucks. The fire department soon arrived, but, unfortunately, the fire truck's foam spray system failed; the truck was useless. Sergeant Patterson stayed atop the burning aircraft and fought the fire until it was extinguished. His quick airborne action possibly saved the crew from a disastrous inflight fire, and his efforts and disregard for his own safety were responsible for extinguishing the fire on the ground. WELL DONE! ■

The PRECISE Word Must Be HEARD

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

APRIL 1980

INFLIGHT WEATHER AVOIDANCE SERVICE—how ATC controllers can help aircrews

WHIFFERDILLS, DIVERGENCIES, AND . . . aerodynamics: roll coupling and other phenomena

TANKERS LIVE LONGER—inflight acoustic crack detection system

UNLUCKY SEVEN—"pressonitis" brews trouble

Another Case Of F.O.D.

CAPTAIN JOHN WITTMEYER
HQ Armament Division (AFSC)
Eglin AFB, FL

■ Just about everyone has heard stories about "Big Ugly" that left you scratching your head and muttering "how did that happen" but here is one that really occurred and falls in the category of amazing.

Seems that one of the F-4s stationed at this base kept coming home with fuel feeding anomalies that were just a little bit on the weird and unusual side of the dash one limits. So, maintenance, after having exhausted most of their troubleshooting procedures, decided to surround the problem by tearing into the fuel system for a somewhat closer look. Now, this turned out to be just what was needed; the culprit and cause of the funny business being a couple of pieces of polished glass that were found in one of the fuel transfer valves. Most surprising of all was the fact that these pieces of glass were of about the same consistency, optical density and color as the glass of a *Coke*® bottle. As a matter of fact, one piece had raised lettering remaining that just about fit the K in *Coke*®, if you had a little imagination.

This was indeed strange! A rather thorough search of applicable pubs could turn up nothing recomending feeding of cola bottles to F-4s as approved procedure. Nor was the direct injection of ground-up glass into the primary fuel tanks considered too good an idea by anyone concerned.

Normally, the story would have ended right there, but in this case

there was another twist in the tal
The local Q.C. was run by a crus
lieutenant colonel who had been
station for quite some time and wl
was also possessed of a rather go
memory. He seemed to remember th
quite some time ago, he had e
countered similar problems with
F-4 while on TDY to one of t
more remote duty locations. H
quickly checked his old TDY orde
and found that yes, indeed, he h
flown this same aircraft on a TD
two years ago (truly amazing)!

A call out to this base quickly turn
up an old line chief who had be
on station there for two plus yea
Not only did a records search reve
that the same aircraft had undergo
fuel tank maintenance, but the li
chief (at that time a crew chief) h
been involved. Yes, sir, he reme
bered what was wrong – had to remo
several pieces of a *Coke*® bott
from the primary fuel tank! Did
have any clue as to the origin? N
sir, nothing on record in that ar
since depot level maintenance a
that had been almost a year prior.

So, the mystery remains. No o
really knows the origin of those piec
of glass. We do know that they h
been in there for quite some tim
How the F-4 managed to digest a
pass as much of the glass as it did
truly amazing. Why there were nev
any larger problems than abnorm
fuel balances is also interestin
Sometimes luck carries you throug
Sometimes truth is stranger th
fiction! ■

ED STATES AIR FORCE

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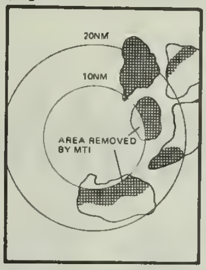

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Inflight Weather Avoidance Service

How can ATC controllers assist aircrews in avoiding thunderstorms? How do they get weather information? What are the limits of their radar? What is the controller's responsibility to aircrews in weather avoidance? These and other questions are answered in this article. Based on a study prepared for a Safety Investigation Board following a fatal aircraft accident caused by a lightning strike, this article should be read by all aircrew personnel.

ATC Radar

■ Radar is a method whereby radio waves are transmitted and are then returned when they have been reflected by an object in the path of the beam. The object could be an aircraft, a ground return, or precipitation.

It is very important for aviators to recognize that there are limitations to radar service and that ATC controllers may not always be able to issue weather information and provide a service. Radio waves are such that they normally travel in a straight line unless they are bent by abnormal atmospheric phenomena such as temperature inversions, reflected by dense objects such as heavy clouds, precipitation, ground obstacles, mountains, etc., or screened by high terrain features. Radar energy that strikes dense objects will be reflected and displayed on the controller's scope. Aircraft (regardless of their altitude) operating at the same range as these dense objects will be blocked out. Aircraft beyond (at a greater range) may also be blocked from the controller's view.

Figure 1 illustrates a radar
that displays a large dark a
weather returns. The radar re
probably not a thunderstor
heavy stratus clouds containin
cipitation. Obviously, this pre
tion is unacceptable since a
operating on the easterly qu
of the radar scope could not b
and are blocked.

Figure 2 illustrates a typical
scope when thunderstorms are
ent. The figure has five weathe
that are probably "CB" type
outline of each cell is the act
mension of the build-up area.
ever, only the black areas ar
played on the scope. Aircraft
that can be seen by the control
indicated by the numbers 1, 2,
There may be others within
that the controller cannot see
are being blocked by the w
returns. This radar presentat
a raw display — no special fe
are used to reduce the effe
weather on radar.

There are some important
tions displayed on Figure 2
should be noted. Weather cell

OR G. E. SCHRIMPF
2, 67 ARRS

ocking part of weather cell ''B''. the dark area of ''B'' is seen he controller; however, the out- of the cell indicates its actual In other words, existing thun- torms may not be seen if there other thunderstorms in front king them out. Remember, radar be reflected from the first dense ct. A controller could vector an aft through area ''B'', believing clear. Area ''C'' is seen on the e because it is taller than ''A'' the radar waves go over the top. ' is the front part of a thunder- n and is displayed; however, area is not seen as it is lower and g blocked by ''D''. In summary, rollers do not always see the en- area weather cell or thunderstorm since radar waves will be re- d from the first and highest pre- ation area.

gure 3 is a side or profile view e area within 30NM of the radar nna. Only aircraft nr 6 would be ayed on an ATC radar scope. other aircraft (one through five) d be blocked by weather cells though some aircraft may be e or below the weather. In this nce a dangerous conflict exists een aircraft nr 6 and nr 3 which flying directly at each other at ame altitude. Unfortunately, the oller would be unable to sepa- he two aircraft since nr 3 is not ayed on this scope.

ar Special Circuits

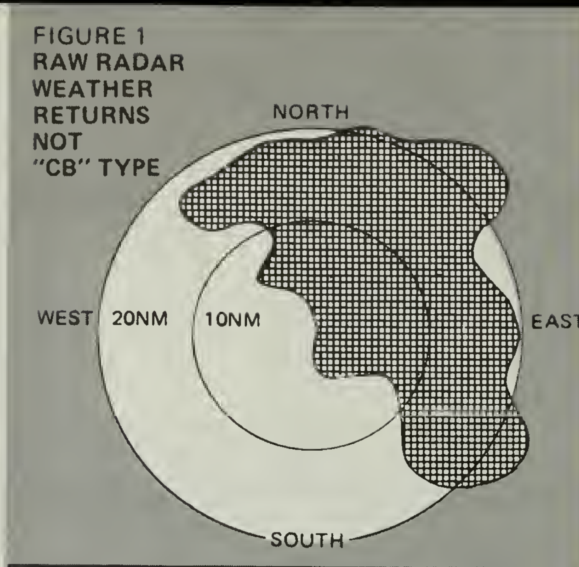
order to improve the display of aft on the scope, technicians loped certain special circuits to nate weather cells.

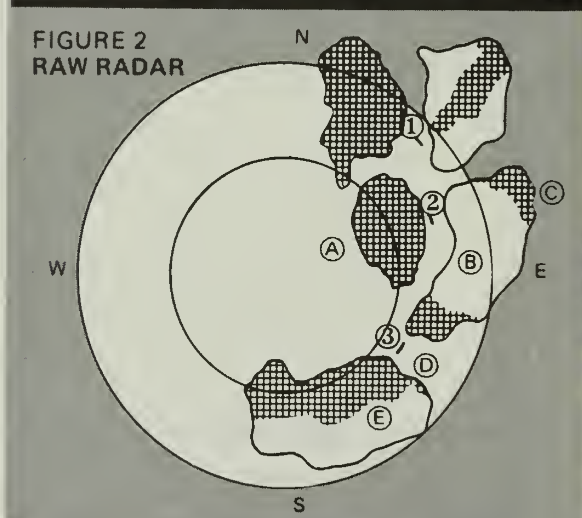
Fast Time Constant (FTC) can be selected by the controller to change the image on the scope. When this mode is used all of the indicators in the facility are changed since the feature works directly on the single antenna head. Therefore, if there are three scopes in a radar unit, all three will be changed. This is true of all special features. FTC removes most ground and weather returns by eliminating all but the leading edge of the return. FTC does not affect the secondary or transponder return. This special circuit allows the controller to track aircraft targets through moderate to heavy returns (see Figure 4). This was the first feature designed by radar engineers to assist controllers by improving the radar presentations.

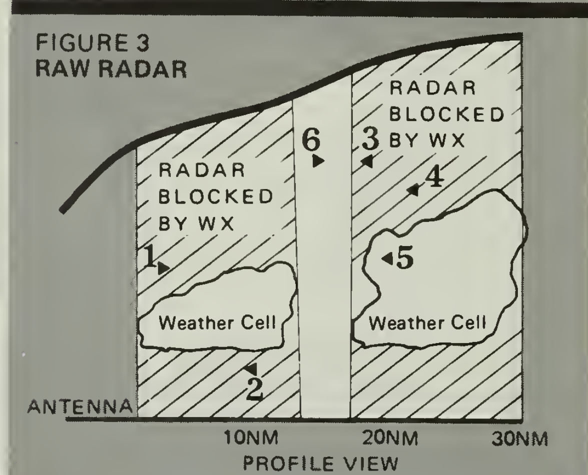
Figure 4 indicates the display seen when FTC is selected. As you can see, the ''CB'' return area has been reduced and only the edges closest to the antenna are now portrayed. Number 4 aircraft can now be seen by the controller since the blocked out area has been reduced. An inherent limitation of this feature is that the display of aircraft can easily ''blend in'' with the weather or ground returns. Tracking an aircraft can be difficult.

Figure 5 is a profile or side view that shows how FTC can improve the scope presentation by reducing the area blocked by weather returns. Aircraft 6, 4, and 2 are now displayed and separation can be applied between those aircraft. Only the dark portion of the weather cell will be displayed on the scope.

Circular Polarization (CP) was







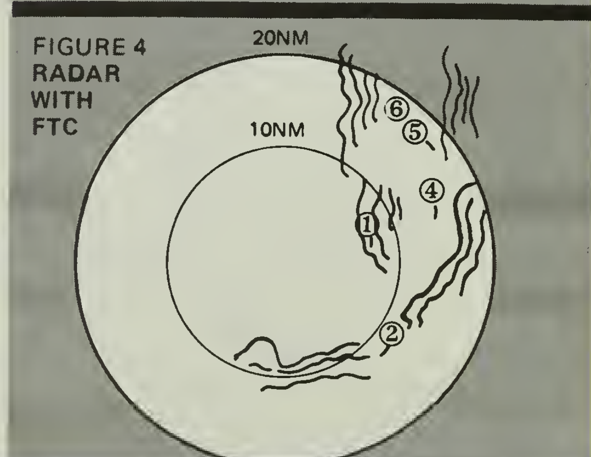


FIGURE 5
FTC

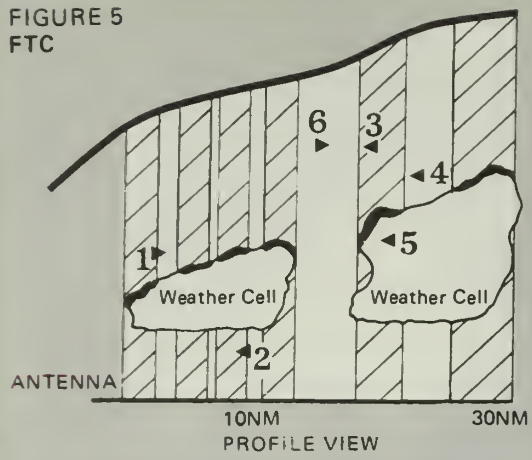


FIGURE 6
RADAR
WITH
CIRCULAR
POLARIZATION

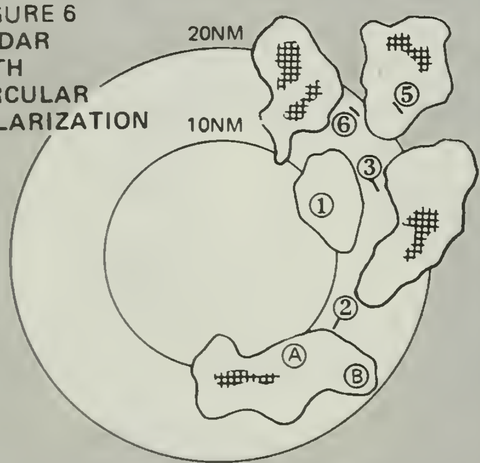


FIGURE 7
CIRCULAR
POLARIZATION

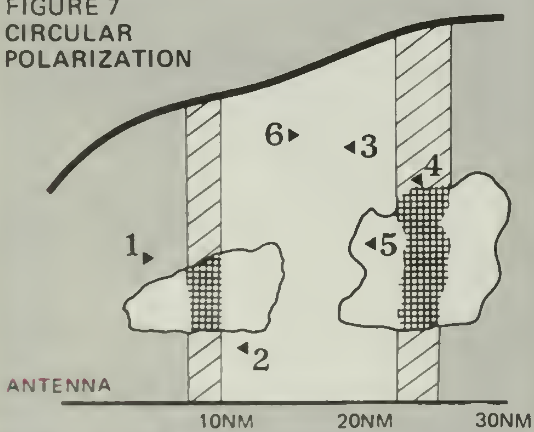
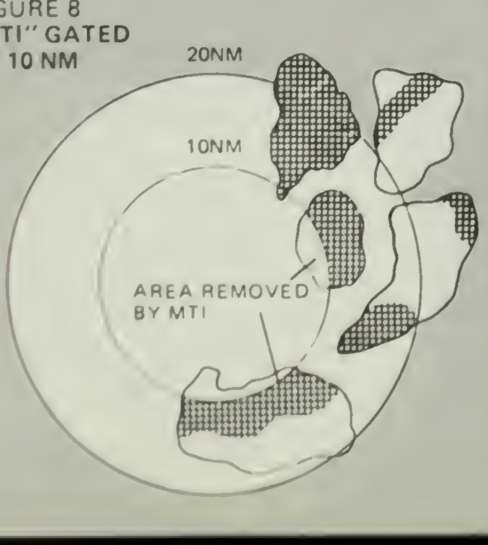


FIGURE 8
"MTI" GATED
AT 10 NM



later installed to offset and compliment FTC (see Figure 6). CP is designed to reduce, as far as possible, precipitation clutter from the radar indicator. However, it does not completely remove intense clutter which is usually associated with thunderstorms. Only the heaviest portions of the weather cells appear on the scope. This is indicated by symbol A, Figure 6.

The outline surrounding the dark cell areas (symbol A) is the actual dimension (symbol B) of the thunderstorm, but is not seen by the controller when using CP. Therefore, an aircraft could be vectored through part of the thunderstorm (area B) unknowingly by the computer.

Figure 7 depicts the profile or side view of how CP works and enables the controller to eliminate weather returns which allows more aircraft to appear on the scope. By using CP, only aircraft nr 4 is blocked by the weather cell. Knowing that CP eliminates almost 70% of weather returns, controllers should use CP only if there is a possibility of losing an aircraft target in the precipitation clutter. CP can be cycled in approximately 7 seconds and supervisors can operate back and forth between raw (linear) and CP to track aircraft through thunderstorms.

Moving Target Indicators (MTI) is a special circuit that is able to distinguish between moving and stationary targets with limited efficiency (see Figure 8). If a target is moving at less than a specified speed, it will be eliminated from the scope. The main purpose of MTI is to eliminate ground returns such as buildings, trees, and other terrain featu
can also eliminate or reduce w
returns. At most terminal AT
cilities the MTI is used to a ra
5 to 10 miles from the airfield
duce these unwanted returns
often will eliminate portions o
ther cells that could affect la
and takeoffs (symbols A and B

To summarize:

Radar can detect weather
Often it is difficult to detern
the precipitation on the scop
thunderstorm or stratus clouds.

Only the surface closest to
dar antenna will be displaye
often the "backside" of the
blocked by its frontal portion.

Since the ATC radar is used
arate aircraft, technicians de
certain special features to eli
weather in order to display a
operating in or near these pre
tion areas. Weather cells occas
prohibit controllers from pro
an aircraft radar separation s
Ground returns also can be elim
by these same special circuits
include FTC, CP, and MTI. Ea
cuit can be used independently
conjunction with another.

There are no established
cedures for use of these speci
cuits. Each controller (assist
the supervisor) should dete
which circuit(s) are required f
best presentation. Atmospheric
ditions and workload are con
ations for this selection. Idea
controller should attempt to eli
only the weather required to p
losing aircraft being controlle
should try to display as much w

continued on

HIFFERDILLS IVERGENCES ND THER OLL OUPLING HENOMENON

ARRY WALKER
imental Test Pilot

early every fighter pilot has, at ime or another, done consecu- aileron rolls out of the sheer erance of flying, yet suffered vere consequences. And don't demonstration teams regu- do multiple aileron rolls? So, sk, why are full deflection rolls nd 360 degrees normally pro- d? Or often, full deflection rolls ally restricted at less than + Let's take a look at some roll- ling problems which make restrictions necessary and some e underlying principles which them.

origins of roll coupling always d mysterious to me—after all, bullets spin stabilized? If so, why can't an airplane roll safely ximum rate for as long as the may desire? The answer is is possible, theoretically, but f the roll rate exceeds a certain um value. But, unfortunately, low this minimum value exists cal roll rate which reinforces the ne aerodynamic modes of n and can cause divergence and le structural disintegration. fore, even if we could roll than this minimum value, we first have to accelerate through tical rate, making the maneuver ely hazardous. Fortunately, in cases and flight conditions, the maximum attainable roll rates are less than critical.

The Coupling Phenomenon

Coupling, by definition, occurs when a disturbance in one axis causes a disturbance in another axis. To illustrate, a longitudinal stick input excites only the pitch axis, producing a single-axis, non-coupled response. A rudder input, on the other hand, excites both the yaw and roll axes, producing a two-axis, coupled response. In this case, the coupling mechanism is aerodynamic—rudder yaws the airplane and dihedral effect rolls it. However, the coupling mechanism can also be due to inertia. For example, inertial forces at high roll rates acting on the airplane can disturb its aerodynamic balance, and in extreme cases, completely overpower its natural stability, sometimes with catastrophic results. However, it is an oversimplification to blame inertial coupling only for roll-coupling problems because in reality roll coupling is composed of three inter-related (and inseparable) coupling mechanisms—kinematic coupling; inertial coupling; and angle of incidence effects.

The roll-coupling mechanisms have been with aviation from the very first, but have only become a problem with the advent of high speeds and jet aircraft; not because of characteristics of the power plants but because of planforms and mass distributions. In order to achieve the necessary high speeds, fuselages have become long and slender and wings small, with a low aspect ratio. This mass distribution is ideally suited for high performance and rapid roll capabilities, but has serious coupling problems at high roll rates. Since none of the contributing mechanisms can be isolated inflight, I'll try to lay them and their interrelationships out for you.

Kinematic Coupling

Kinematic coupling, as shown in Figure 1, is the simplest contributor to roll coupling.

As the airplane is rolled about its longitudinal axis from an initial positive angle of attack (a), the AOA is transformed into sideslip (B) after a quarter roll. As the roll continues, the sideslip is transformed into negative AOA at the inverted position, then into negative sideslip at the three-quarter point, and finally back to positive AOA after 360 degrees of rotation. As the roll continues, sideslip and AOA vary periodically with roll angle. This kinematic effect assumes that the airplane rolls around its longitudinal axis and neglects pitch and yaw stability moments which try to align the airplane with its flight path.

WHIFFERDILLS

continued

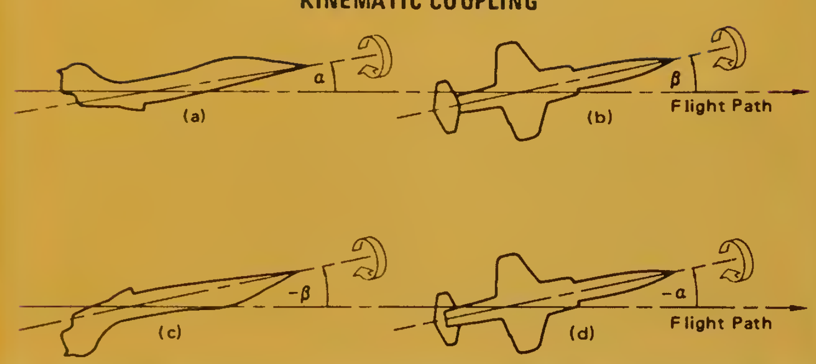


FIGURE 1
KINEMATIC COUPLING

Inertial Coupling

Inertial coupling may best be understood by first simplifying the airplane mass distribution into four equivalent masses—two large masses representing the fuselage and two smaller masses representing the wing (Figure 2).

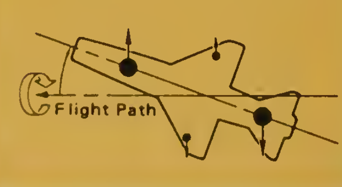
For any given roll rate about the flight path, the fuselage masses are acted upon by centrifugal force and tend to pull away from the roll axis (flight path in this case). These forces are depicted in Figure 3.

The magnitude of this force couple increases with the square of the roll rate and is highly destabilizing.

FIGURE 2
EQUIVALENT MASSES

The wing masses similarly form an opposite stabilizing force couple, but are relatively weak in proportion to the destablizing fuselage-mass force couple of our long, slender airplane. Although it sounds as if our example airplane is unsafe to fly, fortunately, both longitudinal

FIGURE 3
DESTABILIZING YAW FORCES



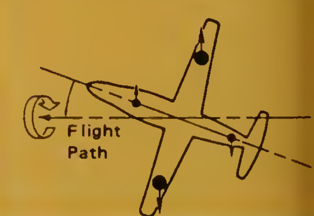
(pitch) stability and directional (yaw) stability, which are normally quite high, act upon the airplane by trying to keep it heading into the relative wind. It is only with high roll rates that the destabilizing forces can overpower the normal aerodynamic stability and cause a roll-coupling yaw divergence.

Now that roll coupling is b
ing clearer, the astute reade
wonder if coupling can be
nated by making the wing m
fect (roll inertia) greater thar
lage mass effect (pitch inert
shown in Figure 4. The win
force couple can now overpov
smaller fuselage-mass force
ple and prevent the nose from
ing away from the flight path.

This approach does indeed
inate the tendency to dive
yaw, but unfortunately, no
couple exists above and belo
airplane which would oppose
ilar divergence in pitch (Figure

Actually, airplanes which
higher roll inertia than pitch
have long straight wings (hi
pect ratio) and a relatively lo
rate capability. Therefore,
though their mass distributio
cludes yaw divergence, their ro

FIGURE 4
STABILIZING YAW FORCES



capability is so low that pitch
gence never becomes a problem

To place the whole mass di
tion issue in perspective, a
slatted F-4 has approximate
times more pitching inertia tha
ing inertia. Even with full ex
wing tanks and three 500-
bombs on each inboard win

FIGURE 5
ESTABILIZING PITCH FORCE

FIGURE 6
SPIN STABILIZED

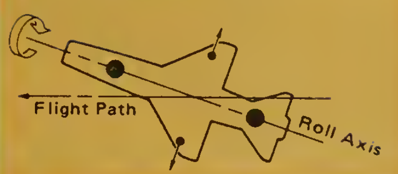
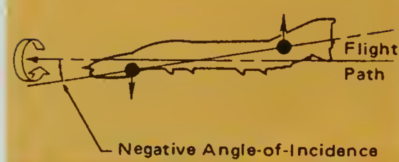


FIGURE 7
ANGLE-OF-INCIDENCE EFFECT



the pitch inertia is still three greater. The numbers for the are only slightly less; a clean has approximately five times pitching inertia than rolling a. Even when loaded with three xternal tanks, four Sidewinders our Sparrows, the ratio is still times as great. Therefore, iner-oupling can be a problem no r what the loading.

lat of our original example – the ? The bullet is spun well above itical roll rate so that it is spin ized, rolling about its "fuse- masses." The inertial gyro- c forces are highly predominant tabilize its attitude, similar to ery rapidly rolling, hypothet- spin-stabilized airplane of Fig- .

casionally, projectiles have known to tumble; this occurs the roll rate decreases to the al rate which reinforces aero- mic modes of motion until gence occurs. This divergence ntical to the roll coupling diver- of a long slender rolling air- except for the direction of ap- h to the critical roll rate.

ng It All Together

w that roll coupling is almost standable, how can I, as fighter pilot extraordinaire, do consecutive 360 degree aileron rolls safely? Our

" . . . Even though rolling limitations may sometimes seem unnecessary, they do have a very firm grounding based on some very real problems . . ."

above discussion suggests that we can if we roll at zero g, keeping the fuselage masses centered on the roll axis and their destabilizing force couple at zero. Wrong – for three reasons!

First, zero g does not ensure that these fuselage masses are on the flight path. (This is the angle-of-incidence effect, the last of the three contributors mentioned earlier.) Depending upon the angle of attack required for zero g and upon the fuselage mass distribution, the angle of incidence of these fuselage masses can be above or below the rolling axis, as seen in Figure 7. This may be most easily visualized in an airplane with a high vertical tail, possibly a high tail-mounted engine, and a low nose. Worse, with this hypothetical airplane, add in low angle of attack at zero (or negative) g and at high speed which further aggravates a negative angle of incidence below the flight path. These are some of the most conducive design and flight circumstances for a catastrophic roll-coupling departure!

Second, even if we could keep the fuselage masses on the roll axis longitudinally, it is impossible to keep the fuselage aligned directionally with the roll axis. Aerodynamic cross-coupling effects such as yaw due to aileron, yaw due to roll rate, yaw due to rudder, and about a dozen other minor lateral-directional aerodynamic effects combine to generate some sideslip. Further, as the airplane rolls, this sideslip becomes angle of attack, becomes opposite sideslip, becomes opposite angle of attack, etc., as these kinematic effects magnify and transform these small disturbances. No longer are the fuselage masses aligned with the roll axis, but are diverging from the axis, increasing the size of their destabilizing force couple.

Third, as the roll rate increases, these periodic variations of sideslip and angle of attack occur at the same frequency as the natural airplane directional and longitudinal

continued on page 26

TANKERS LIVE LONGER

BY BUDD PARRISH
Oklahoma City ALC
Tinker AFB, OK

Mr. Parrish is a graduate of the University of Arizona, BSEE 1965, and Rutgers University, MSEE 1967. He has worked as a Member of Technical Staff, Bell Telephone Laboratories; General Electric Aerospace Electronics System Dept; and is currently an electronics engineer at Oklahoma City ALC. He is responsible for development and production incorporation of the C/KC-135 Acoustic Crack Detection System.

The value of the in-flight acoustic crack detection system (ACDS) for C/KC-135 aircraft.

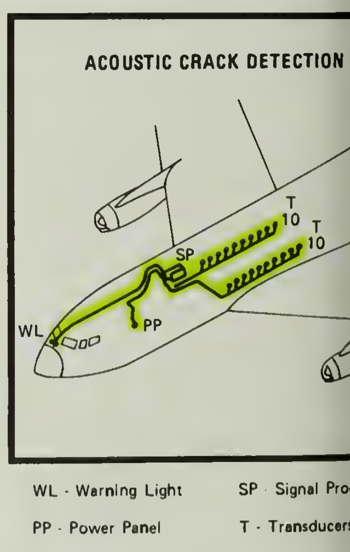
■ A unique nondestructive inspection system has been developed at Tinker AFB to detect unstable fracture of center wingskin panels in -135 series aircraft during flight. The system consists of twenty piezoelectric transducers bonded directly to the aircraft lower center wingskin and the Signal Processor module which monitors signals coming from the transducers. The Signal Processor module discriminates against non-crack signals and activates local and remote caution indicators when it detects the acoustic emission signature produced by unstable fracture in the wingskin.

With approximately 430 systems in service, and nine months of actual field experience, there is now sufficient data to provide a meaningful assessment of the advantages a system such as this offers the aircraft user.

Why the Need for In-Flight Crack Detection?

Prior to the last decade, structural designers thought the key parameter that characterized the ability of a material to withstand service loading was its ultimate tensile strength, and airplane designs were based on that parameter.

Recent studies in the field of fracture mechanics have found that unstable fracture can occur in the elastic region, at stress levels considerably below the ultimate strength of the material. These studies have



developed a new material paran fracture toughness, which is a sure of the ability of a materi resist failure in the presence crack.

oeing designed the 707 model
lane for commercial passenger
ice and the KC-135 for a more re service loading condition as nker for the USAF. In the lower gskin of the 707, Boeing used 4-T3 aluminum, an alloy which only moderate ultimate strength, whose fracture toughness is high. In an attempt to accommodate the higher structural loads to ch the KC-135 would be subjected, the decision was made to 7178-T6 aluminum alloy for the r wingskin. 7178-T6 is a high ormance alloy in terms of its emely high load bearing ability pound of material, but it shares other exotic materials the fact it has an exotic failure mode. 8-T6 has a very low fracture hness.

acture toughness — measuring bility of a material to resist failn the presence of a crack — is a important parameter because materials and their composites ain flaws. Tiny flaws such as s, notches, or defects in welds be present in the material itor may be introduced during cation and thus are built into tructure. As the structure underrepeated loadings, which leads atigue, these subcritical flaws grow to the critical crack size the material, stress level and ce condition and become a runcrack which produces unstable ure.

hereas the outer wing of the functions as an integral fuel iner and cracks in the skin are ered detectable by the fuel leaks cause, the center wing section e airplane is a dry bay area — fuel in bladder tanks — so that s do not cause fuel leaks and, fore, go undetected.

number of unstable cracks has found in the KC-135 fleet e 1971. Those were cracks er than three inches in length, some were complete panel failures. Fortunately, fail safe design is incorporated in the lower wingskin of the KC-135 so that an airplane can withstand a complete panel failure as long as high wing loads are subsequently avoided.

In contrast, the commercial 707 fleet, with wing structure of 2024-T3 aluminum has had no panel failures.

Based on these facts, the USAF KC-135 Structural Advisory Group decided to initiate a program (now underway) to reskin the lower wing of the airplanes in the KC-135 fleet with 2024-T3 material. Since the reskin program was to require ten years, the Structural Advisory Group had to decide between two alternative interim measures to preserve flight safety until reskinning could be completed. They would choose either:

■ A repetitive physical inspection of the wing center section of all non-reskinned aircraft no less frequently than at semi-annual intervals. A major shortcoming of these periodic inspections is that a small stable crack could very well propagate catastrophically on the next flight following a physical inspection. Also, these two yearly inspections would require approximately 900 manhours per aircraft and cause each aircraft to be grounded for approximately 15 days per year; or,

■ An interim measure utilizing a special in-service crack detecting means to detect unstable crack growth in the lower center wing of all non-reskinned aircraft.

The Structural Advisory Group decided in favor of the in-service crack detecting system.

ACDS Production Program

■ The first installation was completed on 13 Mar 79 at Tinker AFB.

■ A total of 625 aircraft will be involved.

■ Approximately 500 installations have been completed to date (15 Jan 80).

■ Approximately 64,000 flight hours have been accumulated to date on various -135 configurations.

■ Cost is approximately $10,000, per airplane for hardware package, installation and technical data.

The ACDS has undergone extensive laboratory testing and refinement. The present configuration has never failed to detect an unstable crack in the laboratory environment. By design, very high sensitivity has been selected to ensure that an unstable crack will be detected in an operational environment. As a consequence of the high sensitivity required to reliably detect center section cracking, the occasional occurrence of a false alarm cannot be avoided.

Early in the production program we learned that incidents involving crack warning indications tended to follow in the wake of the field team installing systems. Most of the problems we had generally occurred within three weeks after the time the using command received the airplane following ACDS installation. We learned that once these infant problems were cleared, and the operational people became familiar with the system, things settled down and incidents became very infrequent.

During the initial nine months of the program, we had 24 false crack indications. The rather thorough investigation which is initiated following an incident determined that two of the earliest incidents were caused by a design deficiency — which was very quickly corrected by design change — and 16 others were caused by equipment failure, faulty installation or operator unfamiliarity. We were unable to relate causes of the remaining six incidents to defects in equipment, installation or procedures, so physical inspection of the wing center sections of those six airplanes was required. In all six cases, no evidence of cracking could be found and the aircraft were returned to flight status, their signal

TANKERS LIVE LONGER continued

processor modules replaced by new ones.

We are continuously working to minimize the number of false indications and their operational impact. As a result of our sensitivity to user experience and feedback from the field, we have made a modification in the equipment design and have issued several changes to improve the clarity and completeness of maintenance and operational data in the T.O.s.

Estimating the Value of the ACDS

1. Analyze actual data resulting from the first nine months of field experience with the ACDS.
2. Project, from the nine month data, aircraft inspection manhour and downtime estimates which may be expected to result from use of the ACDS assuming 625 aircraft equipped with ACDS for one full year.
3. Project aircraft inspection manhour requirements and aircraft downtimes which would result for 625 aircraft for one full year if ACDS were not available.
4. Compare the inspection manhours and aircraft downtimes arrived at by both methods extended over the nine year program life to give an estimate of the value of ACDS to the Air Force.

Conclusions

The data show that over the life of the program, the ACDS:

■ Gives the equivalent of having 13 additional aircraft in inventory by saving 42,858 days of aircraft downtime

FIGURE 1
Nine-Month Field Experience

Nr ACDS Installed	430
Total Flight Hours (Approx)	48,375
Total Incidents*	24
Flight Hrs/Incident (Approx)	2015.6
Total Inspections Performed	6
Flight Hrs Per Inspect (Approx)	8,062.5
M/H Expended For Insp (Approx)	2,500
Avg M/H Per Insp (Approx)	417
Average Days A/C Grounded Due To Incident	4.6
Total A/C Days Lost Due To Incidents (Including Inspections)	110.4

*An Incident is defined as a crack warning indication regardless of cause.

FIGURE 2
Projected aircraft inspection manhour and aircraft downtime estimates assuming 625 aircraft equipped with ACDS for one full year

Nr ACDS Installed	625
Projected Total Flight Hrs	187,500
Projected Flight Hrs/Incident	4,030*
Projected Total Incidents	47
Projected Inspections Required	19
Projected Flight Hours Per Insp	9,675
Projected M/H Per Insp	417
Projected M/H For Insp	7,923
Projected Average Days A/C Grounded Due To Incident	4.6
Projected Total A/C Days Lost Due To Incidents (Including Inspections)	216

*Flight hours per incident will increase due to clearing ACDS of infant mortality failures.

FIGURE 3

Periodic inspection manhour and aircraft downtime requirements without ACDS for 625 aircraft for one full year

The alternative to the ACDS requires two center wing inspections per year for each C/KC-135 A/C. These two yearly inspections would require approximately 900 manhours per aircraft and cause each aircraft to be grounded for approximately fifteen days per year.

Total M/H Per A/C Per Year For Insp	900
Total M/H Per Year 625 A/C	562,500
Total Downtime Per A/C	15 days
Total Downtime 625 A/C	9,375 days

FIGURE 4

Total program manhour and downtime projections for aircraft equipped with ACDS vs aircraft without

Program Year	Number of Aircraft	Number of Inspections Required Without ACDS	Number of ACDS Incidents Expected	Number of Inspections Required With ACDS
1st	625	1,250	47	19
2nd	550	1,100	42	17
3rd	475	950	35	14
4th	400	800	30	12
5th	325	650	25	10
6th	250	500	20	8
7th	175	350	12	5
8th	100	200	7	3
9th	25	50	3	1
TOTAL		5,850	221	89

Without ACDS	With ACDS
M/H required for inspection = 2,632,500 (450 M/H per A/C x 5,850 insp)	M/H required for inspection = 37,113 (417 M/H per A/C x 89 insp)
Total A/C days lost = 43,875 (7.5 days per insp x 5,850 insp)	Total A/C days lost = 1,017 (4.6 days per incident x 221 incidents)

■ Saves 2.6 million maintenance manhours or 1,260 man years

■ Gives the Air Force continuous monitoring of the fracture susceptible wingskin panels

■ Will permit field units to perform occasional inspections for cause rather than imposing on them a heavy burden of routine periodic inspections.

ACDS offers significant advantages at all levels:

■ To the Air Force, it will identify the particular aircraft which develop serious structural damage so that they can be repaired and thus make it possible to keep the vast majority of the fleet continuously in service.

■ To the managers, it provides a tremendous improvement in airframe availability

■ To the flight crews, it provides increased flight safety and a great potential to save lives.

■ To the maintenance community, it provides relief from the burden of frequent, routine periodic inspections.

Even if it were possible to reduce the number of manhours per inspection to two-thirds, the value used in this projection through experience gained by application of a learning curve, the manhour savings that result from the use of ACDS would still be substantial.

■ Crack detection systems designed to monitor stress critical areas of military and commercial airplanes may soon begin to play a key role in flight safety.

■ With development, the C/KC-135 ACDS can be adapted to provide flight safety for other aircraft in the Air Force inventory experiencing similar structural problems.

■ OC-ALC has the facilities and expertise to assist in development of Crack Detection Systems for aircraft applications in other commands where equally large cost savings may be effected. ■

hit my smoke

Unfortunately, the days of a bunch of guys with leather caps and long scarves jumping into open-cockpit biplanes are gone!

MAJOR DAVID V. FROEHLICH
Directorate of Aerospace Safety

■ In the old days when the fr
FAC issued that invitation a
started down the chute, we fe
we had as much going for us a
possible to do! Consistent wit
available, crews target-st
thoroughly, preflighted wel
flew smart. In combat, there wa
room for error, because the gu
SAM launchers and MIG d
didn't honor the "knock it off
What I have a hard time compr
ing is why crews in peacetime
appear to prepare and train lik
did prior to combat!

To go into a combat enviro
you want to be well-schooled
oughly and realistically traine
well armed. You will fly and f
combat as you have practic
peacetime! Sure, you will add
intangibles as judgment, expe
and the age-old "pucker-fa
but even those are based to a
extent on your pre-mission pr
tion.

The days of a bunch of guy
leather caps and long scarves
ing into open-cockpit biplan
gone! (Unfortunately) Not to sa
the good sticks and top-guns
have a quotient of "seat-of-the
skills and intuition, but they a
"book folks!" The mission is to
plex, the machines too fast and
cate, and the scenarios too r
developing for aircrews to rely
pletely on "golden hands,"
of-the-pants skills" and "a
eye." The crews that are consi
on top add *portions* of those ind
traits to a good solid foundat
machine/mission knowledge
flight planning/briefing and

iplined flying! That combination eadly—for the bad guys!

nyone who reads that formula complains about taking the initia- away from the crew, not letting pilot use judgment, etc., is just in tune with today's missions. re is more need and latitude for rew judgment in today's missions n ever before! The people who 't admit that are the ones who are balled up in *fighting* the rules, and "the system" that they don't e the time or energy left for initia- or judgment. Examples—rolling the perch to smoke a simulated guy on the ground is not the time mental hassling over weather imums, switch positions or ROE les of Engagement) type problems. e on and doors manually opened ot the auspicious moment for an a-crew "discussion" of param- rs, procedures or responsi- ies! "On course, on glide path, oaching minimums," on a par- y obscured, 200' yuk day, should be the occasion for confusion it "what happens if I don't see concrete." Those are the situ- ns that call for judgment, experi- and insight, but also require that operator(s) has the procedures, s and equipment parameters so riefed and "second-nature" mitted that there is no question it that input to his decision proc-

o individual will ever argue that book" is perfect or covers every tion. What I will stand behind is 99.97% of the operational pro- res, limitations and restrictions some good basis of establish-ment. Most were written or derived from combat experience or extensive peacetime practice/study. Therefore, the key to survival in training and also to approaching excellence is to arm yourself with a thorough (and current) knowledge of directives, limitations and procedures, and then add your own skill, intuition and judgment. That is how experienced crews live long enough to become experienced!

Modifying tech data or procedures lowers your survival percentages.

Notice I didn't say "add your own interpretation of the rules or procedures." If you have heartburn about the adequacy, accuracy or necessity of procedures, use the squadron and/or safety channels to get them changed. Don't be the one who a witness to the mishap board quotes as having said "That procedure doesn't work for me, so when I fly I use . . ." Modifying tech data or procedures lowers your survival percentage!

There are two other points worth rehammering! First, all of the skill, knowledge and intuition is wiped off the slate by the crew that takes a good-running machine and over-presses or over-commits. Excessive "win-itis" and the "fear of bad numbers" have followed lots of good crews into a smoking hole! The key word is "excessive!" Crews and supervisors need to be watchful for telltale signs of pressing or over-committing. Another worthy reminder goes hand-in-hand with the "press-itis" problem. That is the deadly tendency to stay with a sick machine too long! Looking back at '79 mishap summaries, I find the following statements cropping up over and over:

"The pilot delayed ejection until outside the safe ejection envelope and was fatally injured."

"Ejection was attempted outside the ejection envelope, and the pilot was fatally injured."

"A dual sequenced ejection was initiated, but out of the ejection parameters. Two fatal."

The point—there are tested figures for ejection systems and correlated minimums in your dash-one and ops procedures. Use them! When the maneuver or machine reaches the unacceptable magic number, float down and walk home. If your backside is not rocket or cannon-shell equipped, you don't have the float down option; therefore, your judgment parameters and minimums are different. Regardless, don't wait until too late!

I've said it before, but reading 1979 summaries of 94 Class A mishaps with 83 destroyed aircraft and 77 fatalities prompts me to repeat: Knowledge plus training equals skill. Skill plus discipline equals professional, safe mission accomplishment and survival. You can't win if you don't survive the fight! ■

SAFETY AWARDS for distinguished contributions during 1979

SECRETARY OF THE AIR FORCE
SAFETY AWARD
Major command that flies more than 2% of the total USAF flying time.

MILITARY AIRLIFT COMMAND

General Robert E. Huyser, Commander in Chief, MAC, accepts trophy from Dr. Hans M. Mark, Secretary of the Air Force. The MAC Class A mishap rate equaled the lowest rate in seven years. Airlift and air rescue operations saved 500 lives during response to worldwide disasters. Nuclear, ground and explosives safety programs were equally effective.

SECRETARY OF THE AIR FORCE
SAFETY AWARD
Major command with a small or no flying mission.

ALASKAN AIR COMMAND

Highest award for an effective safety program is presented to Lt Gen Winfield W. Scott, Jr., Commander, Alaskan Air Command, by Dr. Hans M. Mark, Secretary of the Air Force. The command had no Class A aircraft mishaps and no on- or off-duty ground mishap fatalities. Despite harsh environment there were no Class A or B weapons mishaps or injuries.

DIRECTOR OF AEROSPACE SAFETY
SPECIAL ACHIEVEMENT AWARD

For outstanding safety achievements, the Air Force Academy was selected for this award. The USAFA completed 1979 with no ground mishap fatalities and a government motor vehicle rate far below Air Force average. It is the first organization to win the Director of Aerospace Safety Special Achievement Award.

United States Air Force Academy

THE MAJOR GENERAL
BENJAMIN D. FOULOIS
MEMORIAL AWARD

Presented by the Order of Daedalians, the National Fraternity of Military Pilots, the Foulois Award recognizes the MAJCOM with the most effective flight safety program for the preceding year. AFRES reduced Class A mishaps to four and had no Class B mishaps, while performing an extremely varied mission with many different aircraft types.

Air Force Reserve

Unlucky SEVEN

1 2 3 4

MAJOR MICHAEL D. BLANCHARD
Directorate of Aerospace Safety

■ The crew was preparing the "heavy" for flight. Normal preflight operations were progressing with the usual snags—(hydraulic fluid spilled in wheel well, dzus fastener loose on panel) being corrected by the ground crew.

As the crew was accomplishing the interior cockpit check and turned on the aircraft air conditioning system, a dusty odor was noted throughout the crew compartment. The pilot told the ground crew about the problem and the crew chief replied that the air conditioning system had been worked on by maintenance after the last flight. The pilot then assumed the odor was probably residual effects from the maintenance actions.

Preparations for flight continued and the aircraft was taxiied out to the runway for takeoff. There was a delay at the end of the runway for maintenance to work a bomb-nav system problem. During this delay, the dusty odor continued, so the pilot reviewed the dash one for catalytic filter failure. As they waited a little longer, they noted some particles coming out of the air conditioning vents. Environmental maintenance personnel were called to check o the situation and sure enough, th catalytic filter had failed.

By this time, three of the crewmembers were experiencing irritation caused by the particles coming from the air conditioner, the pilot requested the flight surg come out to the aircraft to help evaluate the situation. The pilot discussed the possibility of flight with the flight surgeon. The Doc advised that the dust could cause problem if it continued to come through the vents. In addition, th dash one contains a warning whic states: to avoid possible harmful effects of breathing the powder w filter failure occurs during flight, crew must go on 100% oxygen. T filter was replaced, and the pilot r up engines 3 and 4 to 85% to clea the dust particles from the system. After the run up, particles could n longer be seen coming through th vents so the pilot determined the system was repaired and elected t continue the mission. That was th first link in the inevitable chain.

Immediately after takeoff, all fo main gear failed to retract. Established procedures failed to correct this problem so the pilot elected to fly the mission with the gear down. Due to the increased drag, this would require significan

5 6 7

gher power settings for the mainder of the mission. The second k was then attached to the chain. The high power settings dictated the gear drag caused excessive air w through the air conditioning nts. This began to stir up the dust rticles that had previously been seminated by the filter failure oblem. As the crew began to smell dusty odor they went on 100% ygen. Long hours of wearing a ısk and breathing 100% oxygen is comfortable and tiring. Fatigue ıs weaving its insidious effects into mishap sequence, another link in chain.

After level off, the pilot could not gage the autopilot. That may not und like a biggee to a fighter jock, t on a 10-hour misison it is a real ıg. Again, not cause for abort by elf, and the pilot elected to ntinue the mission. Link nr 4.

When the pilot began to refuel, it ıs obvious that MRT would be quired to maintain position on the ıker. This, of course, increased the oblem of particle dispersion oughout the cockpit. Several ewmembers complained to the pilot headaches, but the pilot attributed em to in-flight tension. Being a ong believer in mission complishment, the pilot elects to ess on. Link nr 5.

One and a half hours later, the crew finally reached the low level of flight. They are fatigued but still determined to complete that mission. Link nr 6.

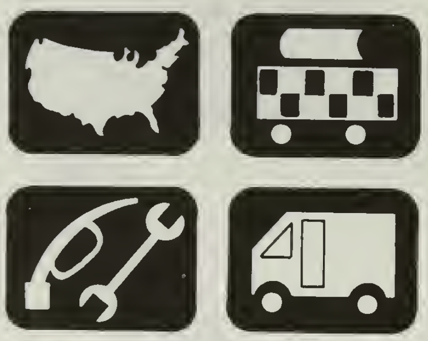
The navigator calls for the crew to descend 1,500 ft at turn point Delta. The radar is setting up for his bomb run and doesn't crosscheck the map. The copilot has a headache and doesn't cross-check his map. The weather is IFR. The pilot descends 1,500 feet. The map calls for the descent at point Echo not Delta. Last link – nr 7.

The aircraft impacted a mountain. All crewmembers were killed on impact. No ejections were attempted.

This crash did not occur. In the actual case, the pilot broke the chain at link nr 5 and aborted the mission to return home safely.

The point is that aircraft mishaps usually occur as a chain of events which act in concert to produce a catastrophic result.

Crewmembers must be aware of this chain of events syndrome and use good judgment to prevent the chain from reaching the critical link. ■



X-COUNTRY NOTES

TA NOTES

■ **MARSHALLING** — Besides what the book says, there are some items that can make the aircrew taxi task a lot smoother and safer!

Marshallers need to be far enough back from the desired parking spot that the crew doesn't lose sight of them below a canopy bow or the nose of the aircraft. If the pilot can't see your signals, you aren't much good to him. Dawn, dusk or when it's dark due to weather, think about the visibility and when you want to switch from paddles to lights or vice-versa. To pilots taxiing in the rain on a dark afternoon, the flashlights may be a lot more help than paddles.

Have some sympathy for the poor pilot as he guides his multi-dollar machine in or out of your dark and sometimes busy, crowded ramp. Everything may look super clear, safe and familiar to you as the marshaller, but from the cockpit it may not appear quite so safe.

REMEMBER — the pilot buys it if a power cart, fire extinguisher, pickup truck or other air machine magically jumps out and smacks his wingtip. If tolerances are close, obtain wing walkers and let the taxiing pilot know that you are watching the close objects. One base back East has a TA marshaller that really moves around, does gyrations and gives thumbs-up signals to each object as you pass. Maybe that's the extreme, but I sure feel that he's taking good care of my machine as I bring it in or out of his ramp. We play "you-bet-your-wings" often enough without having a dumb taxi crunch mishap.

FOD — The transient ramp is a very vulnerable place for FOD to collect because of the variety of aircraft and unstandardized type of operation. Be especially watchful for nuts, bolts, rocks, checklists, rags, fasteners, panels and leftover crewmembers. Don't get in the habit of dropping junk in the back of the TA vehicle or laying objects on the power cart. Wind or jet-blast could make them FOD for a hungry engine, and that is another very unimaginative way to spend tax dollars.

PARKING — At some of the locations where high winds are a problem, keep in mind the parking of the machines *into* the wind. More and more with crowded ramps and limited service, you can't afford to be towing airplanes around to head them into the wind to get them started. There are some airplanes still around that can't start with lots of wind blowing up their tailpipes. Just worth mentionin'!

CREW NOTES:

WATCH YOUR POWER — On the last trip out we saw lots of transient folks in numerous locations taxi in and out with high power. Have a little extra thought about blowing over stands, ladders, power units, chocks, fire extinguishers, etc. Not only is that a good way to hurt someone, but also an opportunity to FOD engines, flight controls and/or cockpits of other aircraft on the ramp. I watched a T-39 pull out of parking, leave the power way up and blow a set of chocks out from under the wheels of another aircraft and into the bushes next to Base Ops. He wasn't the only guilty one because ten minutes la an F-4 pulled out with the levers forward and blew over a small maintenance stand just missing a wingtip. Watch your power!

TAKE TIME WITH THE FORM — Most TA folks will meet you with some type of "Transient Aircraft Servicing Request" form when you deplane at a strange airpatch. We've noticed (and I've been guilty at times) that a lot of aircrews just sign the form on the and don't pay much attention to it Word to the wise! At places with of traffic, that form is the aircrew best insurance for fast and accurat servicing of their aircraft. Spend some time looking at the form, checking the items marked for service. A little extra time may preclude a wrong fuel load or a missed servicing requirement.

FLIGHT PLAN REMINDERS — Thi trip I really fell on my sword twic when I rushed thru a last minute flight plan change and filed a J-ro which (had I read the small print) turned out to be a one-way route a that time period. POINT — We hav packed more info into the FLIP books and charts than the average mental computer can sort in a hurr Spend an extra few minutes after t 175 is done to check your route, t IAF for your destination and the times and altitudes. Also, if there any oddball requirements or reques spend an extra moment when you to make sure there is no confusion Those few extra minutes in Base C can save you lots of minutes on th end of the runway with the engines running and the gas gages winding

THE

REX RILEY
Transient Services Award

AJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

own.

NOTAM BLUES — Not only don't rget to check the NOTAMS, but so the hourly updates when you're anning or stopping thru. Also — ok at the "effective" expiration ne on the hourly update. We found ree places with "out-of-date" dates. The new ones had been ting in the basket in the weather t for as long as 45 minutes in one se. If the effective time has passed the update, query the dispatchers. ou could depend heavily on a mple one line on the hourly update e "RWY03 BAK 12B OUT." vail yourself of all the most current formation you can while still on ra firma!

WARNING — In the interest of good, fe, smooth service for all, let your stination know you are coming. If parting a civil field, call FSS and tivate your flight plan so your bound will be passed to your stination. Pick up the phone and ll "destination ops" to advise them your arrival time and any special quirements — like fuel for two four-ips of F-15s. Call PTD on the way and update your ETA and quirements. Good service depends good communications between all encies. Folks can give you a much tter turn if you don't drop a ombshell of surprises on them!

ETAINED AWARDS

SEYMOUR JOHNSON AFB — A bunch snow gave them fits a few weeks o, but they should be unburied. eir transient ramp is a little narrow it service is good and facilities are .K. Lots of traffic around and a w MOA's make this another sporty flying area.

McCHORD AFB — Best in the West this trip. They get their share (and somebody else's) of rainy weather and low ceilings, but these folks work hard at taking good care of aircrews. Base Ops (part of an old "mole-hole") has been refurbished since my last visit and facilities are now first class. Personnel are conscientious and helpful, and transport, quarters and TA assistance are all top-notch. Keep up the super work!

WELCOME BACK

DOBBINS AFB — Best in the East this trip. Dobbins has been on the Rex Riley list before and we are glad to welcome them back. We weren't able to spend the night but the Base Ops folks, weather personnel and TA pros really blew our socks off. They were as impressive and professional a bunch as we've seen in quite a while. It was a pleasure!

IN GENERAL

We are still seeing improvements. Attitudes are more toward smooth, safe service than ever before. At many locations, folks away from the actual flightline are starting to realize what a large part they play in providing safe, pleasant stays for transients. Our thanks go out to the billeting, inflight kitchen and transport folks that are really in their pitching!

Grumbles and gripes, or pats and praises, fill out an aircrew questionnaire — leave it with Base Ops and forward a copy to: Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AB	Plattsburgh, NY
MACDILL AFB	Tampa. FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso, FL
DOBBINS AFB	Marietta, GA

The Good Samaritan

On a number of occasions Air Force aircrews have been called upon to assist other aircraft in an emergency. The following article describes a cliff hanger of an incident in which an Air New Zealand crew saved an American pilot lost over the South Pacific. Not only does it make great reading, the article reminds us of some mostly forgotten techniques that may still be of use in a situation where our modern electronic wizardy can't hack it.

■ It was a "shorthaul" DC-10 flight, TE103, Nadi to Auckland, scheduled to take three hours. Soon after leaving Fiji at about 5:30 PM on December 21, however, Captain Gordon Vette received a call on HF from ATC, Auckland, which was to stretch his flight time to nearly seven hours.

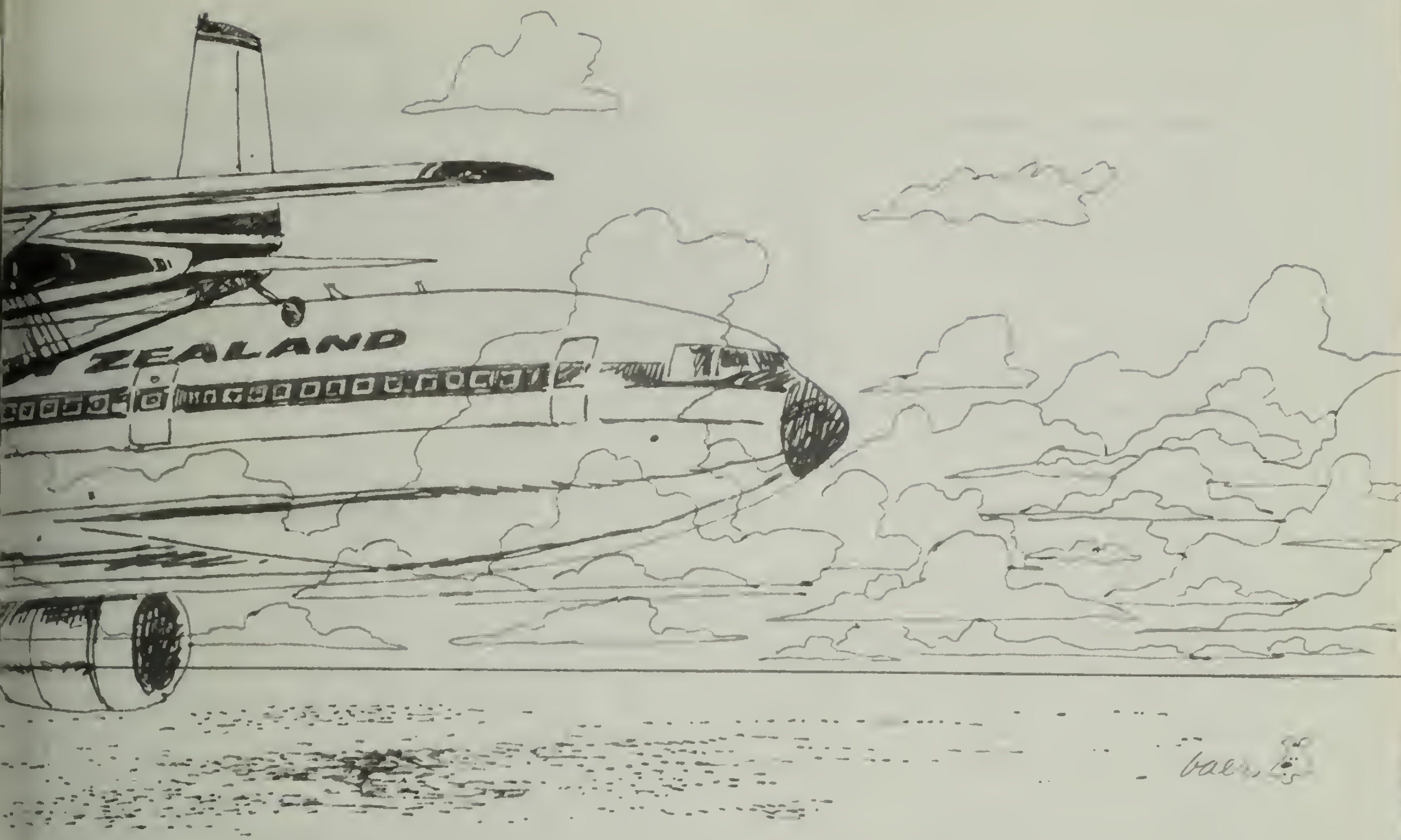
An American-registered Cessna was overdue at Norfolk Island on a flight from Pago Pago. Would Captain Vette contact him and assist if possible?

Requesting the last HF frequency used by the Cessna pilot, Captain Vette called the Cessna on this and eventually got a response from a rather worried young American, J. E. Prochnow of Trans Air, Oakland Airport, California, who was on a delivery flight to Australia. Question and answer revealed that he had cause for worry – he was two hours overdue on his ETA for Norfolk and he estimated he had 2½ hours' fuel left.

He didn't know where he was and faced a real threat of ditching and being lost in the Pacific if the DC-10 crew couldn't find him. With a life clearly at stake, Captain Vette and his crew began to contemplate the ways in which they might – just might – locate a small aircraft lost at 7,000 feet over an infinity of ocean. There followed a prolonged and frustrating "needle-in-a-haystack" search carried out in consultation with the Auckland search and res center where Bruce Millar was coordinator.

The first piece of good fortune Mr. Prochnow lay in the fact tha DC-10 carried only 88 passenger had a heavy fuel load. It had the endurance, therefore, for a fairly lengthy search. An RNZAF Orio alerted to take off from Whenuap would take some time to reach th search area. A second factor was the DC-10 has automatic navigat and its position was, therefore, known at all times without need calculation.

Step one in the search was to request the Cessna pilot to call periodically on the emergency V frequency 121.5 MHz. On the H communication he could be nearl thousands of miles away. But as soon as the DC-10 had him on th shorter range VHF there would b some idea of his distance away. Captain Vette calculated that wit Cessna at 7,000 feet and the DC- at 33,000 feet, VHF contact wou be established when they were at



ɔst 190 to 230 nautical miles apart.
In due course the Cessna came up 121.5 – and the area in which it ıld be was reduced to something ɔroaching 100,000 square miles.
The good news was passed to the ssna together with the advice that re were two navigators aboard the C-10 to work on the problem. alcolm Forsyth, a DC-8 first ficer traveling as a passenger in the C-10 and, like Captain Vette, a ensed navigator, had come forward help.
Captain Vette gave the Cessna ot various radio station frequencies tune to, hoping for a quick "fix" the Cessna's position. He plotted resultant bearings received from Cessna and found they didn't ke sense – in fact they put the uranga radio station north of the ssna, something it manifestly sn't.
t was apparent the Cessna's ADF s at fault, with the needle giving se readings.
'The next thing I said to him was steer direct into the sun while I did the same. I compared our two magnetic headings, and it was apparent that he was out to my left just slightly," said Captain Vette afterwards.

"We decided the sun was the only way we could get a reasonable idea of his position. We needed the bearing and altitude of the sun from his position compared with our own."

"The trouble was neither of us had a sextant to make the comparison. I seemed to recall that a clenched fist at arm's length represented about 10 degrees, and a finger was a little more than a degree-and-a-half," said Captain Vette.

"So I told him to put his arm out and measure the number of fingers between the center of the sun and the horizon. I did the same and it appeared we had about a 3 degree sun altitude difference – something around 180 nautical miles, with him closer to the sun than me."

The problem then was to ensure the Cessna pilot would spot the much larger DC-10 once it was in his immediate area. Sighting the small aircraft from the DC-10 would be more difficult. Captain Vette had already made a turn to discover that the DC-10 was leaving no contrail, and even a change of altitude did not produce one.

"I decided that if we got into the vicinity of the Cessna, I would "paint" a contrail with a fuel dump. This would cost me 2½ tons of fuel for every minute I let the dump continue," Captain Vette said.

He flew towards the area in which he calculated the Cessna was and when he estimated the Cessna was close, he told the Cessna pilot to turn his tail to the sun while he headed the DC-10 into the sun and told the lost pilot they should be heading straight towards each other.

Then he did a two-minutes fuel dump but, disappointingly, the Cessna pilot could not see it. Another fuel dump should have painted a line 30 miles long in the sky, but again the lost pilot couldn't see it.

It was difficult to understand but,

The Good Samaritans continued

on back-plotting, Captain Vette estimated he was probably almost directly above the Cessna when he did the fuel dumping.

By this time there was considerable concern on the DC-10's flight deck for it appeared the lost pilot was going to have to ditch alone somewhere in the Pacific. What to do next?

Sunset was approaching, and Captain Vette asked both Norfolk Island and the Cessna pilot to report their exact times of sunset to him. By comparing the two times, he was able to determine whether the Cessna was east or west of Norfolk. This seemed to put the Cessna about 5.6 degrees to the east of Norfolk.

This tallied with the DC-10's original estimates of his longitude and also seemed to tie in with the oral "boxing in" technique Captain Vette had been using on the VHF—a time consuming method involving turning when the Cessna's 121.5 signal faded and traversing a long radius when it came back to gradually pin down the Cessna's area of probability.

At 0815Z the Cessna's signal was lost but Captain Vette made a 90 degree turn left and picked it up again at 0825Z. He now headed for position 30S 177E and told the Cessna pilot, whose signal was now very strong, to circle and look for his powerful strobe lights.

Then, at 0902, the Cessna pilot reported sighting what appeared to be a surface light. Captain Vette told him to fly towards it and report its heading (310 degrees) but to make sure quickly that it wasn't a star low on the horizon.

The Cessna pilot had now exceeded his original endurance estimate and if the light proved to be a ship he might well be able to save his life with a ditching in the sea.

He reported the light was getting closer, indicating it was not a star, and then reported he was over some type of vessel. Captain Vette told him to circle the vessel, flashing his landing lights to attract attention, and to give a description of the vessel. From this description, the vessel appeared to be an oil rig and there was confirmation when the Cessna pilot reported two tugs ahead of it.

It was the Penrod rig, en route from New Zealand to Singapore.

From the Marine Division in New Zealand, part of the search organization, Captain Vette was given 119.1 as the Penrod's radio frequency and 31S 179.21E as its position. It was apparent that the Cessna would have to ditch, since this position was too far from any land. And indeed, the Penrod rig had already hove to and was launching a boat.

The Penrod position given, however, conflicted with the fade pattern and estimates calculated on the DC-10 flight deck. Captain Vette, therefore, called for a position confirmation direct from Penrod. This was given as 31S 170.21E—within 150-160 miles of Norfolk. It was just about the position where the fuel dump had been made earlier.

This put Norfolk Island just within range on the new endurance figure given from the Cessna, so Captain Vette gave the pilot the choice of ditching or taking a heading from the DC-10 for Norfolk.

The response from the Cessna was emphatic. The sea looked cold and dark; a heading for Norfolk please.

Captain Vette passed a heading of 290 degrees magnetic to the Cessna and told the pilot he would bring the DC-10 down to 10,000 feet and overtake the Cessna on its starboard side.

Even with landing lights on, the Cessna was difficult to see, but the DC-10 crew picked them out to the delight of their 88 passengers wh[o] had been kept informed through [each] phase of the hunt.

"We tucked him in behind, cl[ear] of our jet wash, and led him dire[ct] to Norfolk," Captain Vette recal[led].

Since he could not slow below [...] knots he told the Cessna pilot to follow his strobe lights and to re[port] immediately if he lost them, whereupon the DC-10 would circ[le] back.

This didn't prove necessary, although the DC-10 forged ahead [and] was overhead Norfolk when an [...] from New Zealand joined the Ce[ssna] with 40 or 50 miles to run, and l[ed it] in.

The last act was for Captain V[ette] to inform his passengers that the Cessna had made it on almost dr[y] tanks, and to set course for Auck[land] where he landed at 1:09 AM loca[l] time—just 3 hours 54 minutes la[te].

The search was a team effort b[y] the DC-10's flight deck crew, supplemented by Malcolm Forsy[th] and Captain Vette commended th[em] in a special report to Air New Zealand as well as the cabin crew under Chief Purser Paul James w[ho] worked several unexpected hours keeping the passengers happy an[d] informed.

While Captain Vette and First Officer Forsyth were working on ways of locating the Cessna's position, First Officer Arthur Do[...] and Flight Engineer Gordon Broo[...] carried a continual critical work l[oad].

"The fact that they were such exceptional airmen helped a grea[t] deal," said Captain Vette.

(It occurs to us that many of th[e] old navigational and piloting "dodges" may well have been forgotten or just not known in ou[r] technological age, yet as this stor[y] shows they could be useful some day.)—Courtesy *Flight Safety Fo[...]* January No. 1/80. ■

Inflight Weather Avoidance Service

continued from page 5

possible in order to provide an visory service.

Traffic Control's sponsibilities

'SAF and U.S. civilian conllers are bound by procedures pubned in FAA Handbook 7110.65 r Traffic Control). This handbook ecifically established guidance controllers. involving weather. agraph 522 states:

'a. Issue pertinent information observed/reported weather or ff areas. Provide radar navigaal guidance and/or approve devins around weather or chaff area en requested by the pilot. Do not the word 'turbulence' in describ radar derived weather.

"(1) Issue weather and chaff rmation by defining the areas of erage in terms of azimuth (by rering to the 12 hour clock) and ance from the aircraft or by inating the general width of the area the area coverage in terms of s or distance and direction of fixes.

"(2) When a deviation can be approved as requested, and the ation permits, suggest an alterna course of action.

'b. In areas of significant weath plan ahead and be prepared to gest, upon pilot request, the use lternative routes/altitudes.

'522.b NOTE—Weather signifit to the safety of aircraft includes h conditions as tornados, lines hunderstorms, embedded thunderms, large hail, wind shear, mode to extreme turbulence (including T), and moderate to severe icing.

'c. Inform any tower for which you provide approach control services if you observe any weather echoes on radar which might affect their operations.

"Phraseology:

"WEATHER/CHAFF AREA BETWEEN (number) O'CLOCK AND (number) O'CLOCK (number) MILES. or

"(number) MILE BAND OF WEATHER/CHAFF FROM (Fix or number of miles and direction from fix) TO (fix or number of miles and direction from fix). or

"Level number and intensity adjective) WEATHER ECHO BETWEEN (number) O'CLOCK and (number) O'CLOCK (number) MILES, MOVING (direction) AT (numbers) KNOTS, TOPS (Altitude)."

"521.c. Example—'Level 5 intense weather cell between eleven o'clock and one o'clock, one zero miles. Moving east at two zero knots, tops flight level three niner zero.

"521.c. NOTE—The third phraseology is only applicable when the radar weather echo intensity information is determined by NWS radar equipment."

This paragraph on weather is located in the "Additional Services" section of the ATC Handbook. It is considered to be an additional duty. Paragraph 510 states:

Application

"Provide additional services to the extent possible contingent only upon your capability to fit it into the performance of higher priority duties and on the basis of the following:

"510. Reference—Duty Priority, 22.

"510. NOTE—The primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic. In addition to its primary function, the ATC system has the capability to provide (with certain limitations) additional services. The ability to provide additional services is limited by many factors such as the volume of traffic, frequency congestion, quality of radar, controller workload, higher priority duties and the pure physical inability to scan and detect those situations that fall in this category. It is recognized that these services cannot be provided in cases in which the provision of services is precluded by the above factors. Consistent with the aforementioned conditions, controllers shall provide additional service procedures to the extent permitted by higher priority duties and other circumstances. *The provision of additional service is not optional on the part of the controller, but rather is required, when the work situation permits.*

a. Factors such as limitations of the radar, volume of traffic, frequency congestion and volume of workload.

b. You have complete discretion for determining if you are able to provide or continue to provide a service in a particular case.

c. Your reason not to provide or continue to provide a service in a particular case is not subject to question by the pilot and need not be made known to him."

Additional services are third in controller's priorities behind the

separation of aircraft and other required services.

Information Available to Aircrews

USAF aircrews have limited information available to them in flying publications or regulations. AFR 60-16, Interim Change 78-01 to page 5-6, para 5-22, contains the following guidance:

"a. Thunderstorm penetration. Except for MAJCOM approved missions requiring planned penetration of thunderstorms, there is no peacetime mission which requires intentional thunderstorm penetration.

"b. Operations in the vicinity of thunderstorms. Apply the following procedures for operations in the vicinity of thunderstorms:

"(1) Do not take off, land, or fly approaches at an aerodrome if thunderstorms are producing hazardous conditions. Such hazardous conditions may include hail, strong winds, gust front, wind shear, heavy rain, or lightning (see AFM 51-12).

"(2) When observed or reported thunderstorm activity adversely affects the flight plan route, pilots will delay the scheduled mission, alter the route of flight to avoid the thunderstorm activity, or proceed to a suitable alternate. Aircrews will use all available facilities, to include radar, PMSV, and PIREPS, to avoid thunderstorm activity, AFM 51-12 contains a discussion of operations in and in the vicinity of thunderstorms.

"(3) MAJCOMS will supplement this paragraph as necessary to provide additional guidance. Such guidance will consider such factors as mission urgency, aircraft operating characteristics, aircrew experience, and climatological conditions."

The Airmen's Information Manual contains an indepth discussion that covers thunderstorms, radar, and ATC procedures. Part of that publication is:

ATC Inflight Weather-Avoidance Assistance

"To the extent possible, controllers will issue pertinent information on weather or chaff areas and assist pilots in avoiding such areas when requested.

"Pilots should respond to a weather advisory by either acknowledging the advisory or by acknowledging the advisory and requesting an alternate course of action as follows:

"a. Request to deviate off co
by stating the number of miles
the direction of the requested d
ation. In this case, when the reque
deviation is approved the pilo
expected to provide his own nav
tion and to remain within the
cified mileage of his original cou

"b. Request a new route to a
affected area.

"c. Request a change of altit

"d. Request radar vectors aro
affected areas.

"For obvious reasons of saf
an IFR pilot must not deviate f
the course or altitude/flight level w
out a proper ATC clearance. *W
weather conditions encountered
so severe that an immediate devia
is determined to be necessary
time will not permit approval by A
the pilot's emergency authority
be exercised.*

"When the pilot requests cleara
for a route deviation or for an A

ar vector, the controller must luate the air traffic picture in the ected area, and coordinate with er controllers (if ATC jurisdic- nal boundaries may be crossed) ore replying to the request.

'It should be remembered that controller's primary function is provide safe separation between craft. Any additional service, h as weather avoidance assist- e, can only be provided to the ent that it does not derogate the mary function. It's also worth ing that the separation workload enerally greater than normal when ather disrupts the usual flow of fic. ATC radar limitations and quency congestion may also be a tor in limiting the controller's ability to provide additional serv-

'It is very important therefore, the request for deviation or radar tor be forwarded to ATC as far dvance as possible. Delay in sub- ting it may delay or even preclude C approval or require that addi- nal restrictions be placed on the arance. Insofar as possible the owing information should be fur- ned to ATC when requesting clear- e to detour around weather ac- ty:

. Proposed point where detour commence.

. Proposed route and extent of our (direction and distance).

. Point where original route will esumed.

. Flight conditions (IFR or R).

. Any further deviation that may ome necessary as the flight pro- gresses.

f. Advise if the aircraft is equipped with functioning airborne radar.

"To a large degree, the assistance that might be rendered by ATC will depend upon the weather information available to controllers. Due to the extremely transitory nature of severe weather situations, the controller's weather information may be of only limited value if based on weather observed on radar only. Frequent updates by pilots giving specific information as to the area affected, altitudes, intensity and nature of the severe weather can be of considerable value. Such reports are relayed by radio or phone to other pilots and controllers and also receive widespread teletypewriter dissemination.

"Obtaining IFR clearance or an ATC radar vector to circumnavigate severe weather can often be accommodated more readily in the enroute areas away from terminals because there is usually less congestion and, therefore, greater freedom of action. In terminal areas, the problem is more acute because of traffic density, ATC coordination requirements, complex departure and arrival routes, adjacent airports, etc. As a consequence, controllers are less likely to be able to accommodate all requests for weather detours in a terminal area or be in a position to volunteer such route to the pilot. Nevertheless, pilots should not hesitate to advise controllers of any observed severe weather and should specifically advise controllers if they desire circumnavigation of observed weather."

Summary

Aircrews and controllers must work together when flight is conducted near thunderstorms. ATC has a limited capability to assist aircrews by use of radar. However, certain inherent limitations need to be known by aircrews when working within the ATC system. ATC will attempt to vector aircraft around displayed weather cells upon pilot request. On occasions, controllers may unknowingly suggest a heading or route that would place an aircraft in a thunderstorm. A controller may be using special features on the radar to eliminate weather.

The first priority of Air Traffic Control is to provide separation between aircraft. Weather information need not be issued if other duties preclude providing this service. This is an additional duty; however, pilots should not hesitate to advise controllers of any observed weather and should specifically advise controllers if they desire circumnavigation of observed weather. Pilots often will see thunderstorms or portions not seen on radar. The best way to avoid other aircraft and thunderstorms still remains with the pilot—looking out the windscreen in order to see and avoid. ■

Gold In The Cockpit

There's nothing wrong with being a gourmet, unless one's proclivity for creative eating causes someone trouble. The following, submitted by a Danish Air Force Chief of Safety, tells of an incident which could have had serious consequences because of a gourmet's lack of good judgment.

■ Recently a Danish Draken pilot "struck gold"; unfortunately it happened in an aircraft during flight. The pilot flew an ACT mission which involved negative G manoeuvres. During one of these manoeuvres a 1-krone piece (coin) appeared in the pilot's view and he managed to catch it. After landing, the pilot found that his ballpen was missing, luckily enough one might add, because during the search in the aircraft for the ballpen a 5-krone piece was found. Now the men got greedy and decided to remove the ejection seat, and sure enough the fortune was revealed: another 5-krone piece and four 1-krone pieces, so we now had a total of fifteen kroner, not bad (about $3). Then the flight safety people heard about it, confiscated the money and initiated an investigation. We also found a piece of paper containing the name and address of a USAFE employee. A phone call revealed the whole story and confirmed the total sum of money to be exactly 15 kroner.

Some time ago the aircraft in question visited a USAFE base. The pilot was contacted by the employee, who wanted to buy some remoulade (Danish food dressing) and would leave the pilot his address next day. Unfortunately, the p did not meet the man the next and forgot all about the episode returned to home base, not know that he actually carried 15 kro wrapped in a piece of paper, so where in the cockpit.

The aircraft flew 15 sorties be the money was found. Imagine w sort of damage five quarters and Ike dollars could cause if lost i cockpit.

The Danes are very proud of t food products, especially w foreigners show an interest in th and we will be glad to meet reasonable request in the future. turn, we request the transactior take place in "broad daylight" eliminate surprises of this natu —P. E. Hansen, Chief of Fli Safety, Airstation Karup, D mark. ■

WHIFFERDILLS continued from page 7

motions (most easily seen with stab aug or CAS off, these are the "Dutch roll" and the "short period" modes of motion), reinforcing them until a divergence or catastrophic failure occurs. This reinforcing effect may be best understood as a resonance between inertial and aerodynamic forces, leading to ever-increasing yaw and pitch excursions from the flight path.

Some Solutions

Now that the reasons for roll coupling are clear, how can it be avoided? Generally, changes of mass distribution are impractical, but rate dampers in the pitch and yaw axes can reduce coupling into the Dutch roll and short period modes of motion by damping the motions themselves, thereby raising the critical roll rate for divergence. Other preventive measures also are normally required, such as limiting roll travel to less than 350 degrees. This restriction limits the time duration that the destabilizing forces can reinforce the yawing and pitching modes of motion and thereby keeps sideslip and angle of attack within acceptable limits.

Other preventive measures involve placing restrictions against full deflection rolls at less than one, or less than zero g's, in order to limit angle-of-incidence problems. Lateral stick stop devices have also been used to lower maximum roll rates in some fighters. Similarly, CAS and fly-by-wire control systems, employ lowered aileron gains and deflections, or use electronic roll rate limiters in order to keep roll rates less than critical for 360-degree rolls. Such limiters are normally dependent upon flight conditions to avoid poor transient lateral response in low speed flight conditions.

In summary, today's high performance fighter airplanes are typified by high fuselage densities and little rolling inertia in order to attain the high speeds and good rolling performance required. Accordingly, they suffer from a cross-coupling resonant condition when gyroscopic and inertial forces associated w high roll rates overpower nor aerodynamic stabilizing forc leading to divergence and depar from controlled flight. Unlike l of-control departures at high an of attack, these cross-coupling partures occur primarily at h speeds and low angles of att where roll rates are highest. U fortunately, if this type of dep ture does occur, the results usually catastrophic due to extren high airloads. Even though roll limitations may sometimes se unnecessary, they do have a v firm grounding based on some v real problems. Suitable respect these limitations can go far towa making high performance fli safer and more enjoyable. So next time you hear someone gru ble about "unnecessary rolling strictions," point out these dang and explain why the restrictio exist. After all, you're an exp now! —Courtesy *Product Supp Digest*, McDonnell Aircraft Co pany. ■

WHAT, ME WORRY?

CAPTAIN GORDON N. GOLDEN
Directorate of Aerospace Safety

What a beautiful day to go slip surlies. Too bad it's a two-er, but at least I'm in the front ay. "You ready to start? Let's this show on the road."
unds like a good start . . .
ges all look good . . . power cart connected . . . run'er up for the ecks . . . what was that? "What . . .?"

Ground egress (ground ē'gres) Something you have to do with fe support troop every six nths to fill a square on his ning board. Right? Wrong! It y save your life.

Vhy all the hassle? Anybody get out of his aerospace chine while it's sitting on the und, no sweat. Wrong again. ybe we should take a look-see the record and see what we find. Yeah, I thought so, e's just a couple from last year.

A fighter jock on a cross-untry refueling stop was starting his machine when an aircraft air bottle exploded and ruptured a fuel tank; the plane was engulfed in flames. In his attempt to exit the area posthaste, the aviator got his egress a little out of sequence and didn't separate from the survival kit. So, he sat down and decided to initiate his alternate course of action to separate himself from his encumbrances. Everything was hunky-dory as he leaped over the canopy rail except that he forgot the oxygen hose, which tied him to the aircraft. He died because he couldn't execute his ground egress when it counted.

Another fighter driver and his trusty WSO were in the process of rumbling down the runway on take-off when they had a hardover on the nosewheel steering which rapidly transformed their air machine into a flaming sled as it left the runway. What transpired over the interphone we'll never know, but it must not have been very enlightening because the front seater unstrapped for a ground egress and the back seater initiated a sequenced ejection. The front seater died as a result of his no-chute ejection. The rear seat rocket didn't fire, and the WSO died when he hit the runway still in the seat. Had they discussed what they would do in a ground emergency? Do you?

The whole airplane's on fire! Gotta get outa here . . . where's that kit release? . . . straps . . . over the side. Sure is hard to run with that survival kit draggin' along . . . wish I had my nomex jacket. . . .

Your ability to set an emergency ground egress speed record and do it right could be the difference between life and death. It has been for others. ■

CAPTAIN
Stephen J. Feaster

FIRST LIEUTENANT
Roy A. Gilbert

27th Tactical Fighter Wing
Cannon Air Force Base, New Mexico

■ On 20 September 1979 Captain Feaster and Lieutenant Gilbert were flying a night range mission in an F-111D. During base turn for weapon delivery, while performing automatic terrain following flight at 1,000 feet AGL, both crewmembers heard a thump and observed a flash of light from the left side of the aircraft. They checked the engine instruments, noting nothing unusual. At the same time, Captain Feaster disengaged the automatic terrain following system, rolled wings level and began a climb. He checked engine response to throttle movement and ascertained that both engines appeared to be operating normally—the only discrepancy was the left nozzle slightly open. The crew again heard a thump and saw a flash of light followed by left engine rollback, which was confirmed on engine instruments. As Captain Feaster retarded the left throttle, the left engine fire warning light illuminated. He continued retarding the throttle to the cutoff position and Lieutenant Gilbert depressed the fire pushbutton and activated the fire agent discharge. The Range Control Officer (RCO) was notified of the situation and confirmed that he had seen indications of a fire. The crew then contacted the Supervisor of Flying (SOF), notifying him of their intention to land as soon as possible. During this time the fire light went out. Captain Feaster checked the warning circuit, found it to be inoperative, and notified the SOF he might still be on fire. The tower turned the runway lights for the nearest runway to bright and Captain Feaster visually acquired the runway, positioning himself to intercept final approach approximately seven miles from touchdown. While positioning the aircraft, the crew configured for a single engine landing and computed heavyweight final approach speed. Having no instrument glide path aids available, Captain Feaster requested the VASI lights be turned on. While on final approach, the SOF advised the crew that they appeared to be on fire and should take the approach end barrier. Captain Feaster and Lieutenant Gilbert completed a final review of required checklist items and reconfirmed proper configuration prior to executing a flawless approach end barrier engagement. As the aircraft came to a stop, leaking fuel from a ruptured fuel tank engulfed the aft section of the aircraft in flames and the crew successfully ground egressed. The prompt reactions and superior airmanship displayed by Captain Feaster and Lieutenant Gilbert, with aggressive support by the base fire department, not only averted injury or loss of life, but held aircraft damage to a minimum. WELL DONE! ■

☆U S Government Printing Office 1980—683-214/6

STATES AIR FORCE

Vell Done Award

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and for a
cant contribution
to the
States Air Force
ident Prevention
Program.

FIRST LIEUTENANT

James R. Mitchell

81st Tactical Fighter Wing

■ On 14 August 1979, Lieutenant Mitchell was flying an A-10A on a range mission in The Netherlands. The range work was uneventful, but while returning to England at FL 200 over the North Sea, he noted that the control stick would not move aft of the neutral position. The aircraft began a shallow dive which could not be controlled by back-pressure. Lieutenant Mitchell informed his flight lead of the problem, and lead suggested unloading the aircraft and snapping the stick aft to free the jam. This maneuver freed the stick and he leveled off at FL 170. Lieutenant Mitchell declared an emergency and began a slow descent into RAF Bentwaters. When he attempted to level off at FL 120, the stick again would not come aft of the neutral position. He again unloaded the aircraft and snapped the stick aft, freeing the jam. Another slow descent was initiated, and the stick jammed for a third time. Lieutenant Mitchell unloaded and attempted to snap the stick free as before. Rather than freeing the jammed condition, the aircraft controls remained jammed, and the aircraft entered a 25 to 30° nose down attitude. The aircraft rapidly lost altitude, and he tried to free the stick by unloading and applying as much back-pressure as possible. He informed lead that he would eject if he could not free the stick by 2,000 feet AGL and, as a last effort, braced his foot against the instrument panel while continuing to pull as hard as possible. This effort freed the stick and he leveled off at 1,000 feet AGL. After performing a controllability check, he attempted to land. At landing airspeed, after the gear was lowered, the stick jammed with the aircraft in a slightly nose high attiude. Lieutenant Mitchell raised the gear and freed the jam by using firm back-pressure on the stick. After another controllability check, with satisfactory results, Lieutenant Mitchell left the aircraft configured with gear down, flaps up, and speedbrakes closed, and executed a flawless landing with a minimum flare in a high cross wind. Investigation revealed that a pencil had lodged in the bob weights of the flight controls. Lieutenant Mitchell's calm and timely actions resulted in the safe recovery of the aircraft. WELL DONE! ■


Make Sure Of Your CLEARANCE
Before You Get On The RUNWAY!

AEROSPACE

FETY • MAGAZINE FOR AIRCREWS

MAY 1980

FOD--it could be hazardous to your health

BY CAPTAIN DENNIS STORCK
Directorate of Aerospace Safety

■ Everyone knows what FOD is, right? Foreign Object Damage, that's what. It's those stones and other debris laying around the flight line. Ever think of your clothing as FOD? How about those protectors you wear to save your ears? Your watch, gloves, even you? Well, if you haven't considered all of the above as possible sources of FOD, the time to start is now.

During 1979, several pieces of clothing and equipment (headsets, intake covers, cords, streamers, flashlights, screwdrivers) were ingested into aircraft engines, costing

FOD—*yes, pilots, this means you, too.*

the Air Force thousands of dollars. But, most alarming, one crew chief lost his life when he was ingested by an engine.

Now, I know you're all thin "Who would do a thing like th But, believe me, these en FOD incidents occurred at a of one every two weeks a average cost of over $23 each. What can the crewme (yes, pilots, this means you, do to prevent what many w term carelessness?

First, check the immediate area during preflight. When start your engines, start your c ing. If an engine run becc necessary, clear the front front) of the aircraft as well a aft. Believe it, the jet engine duces enough force to act suck standing water off the gr and through the engine. And guys up North, beware of inge loose chunks of ice. Ice can nificantly modify turbine bla beyond repair. Most of all, en verbal coordination with the gr crew. Be sure they make n tempts to traverse the front o affected engine. Additionally, sure all their articles of clot and equipment are secure.

If you find yourself needing m tenance while engines are ning (i.e., oil pressure prob hydraulics, etc.), requiring th stallation of a downlock or sa pin and its associated "rem before flight" streamer, be you get it back just the way it before installation.

When you have the fire de ment or transient alert monitor engine start, be sure their hat going to end up as confetti your tailpipe.

The fact is, there is a lot of ventable damage being do Damage that many times ca unnoticed until the aircraft is borne, when the circumstan could be catastrophic. Most o it's not necessary to lose a life cause of carelessness. And it happen fast. Make the FOD ch a permanent part of your du Don't let FOD be hazardou your health, or anyone elses.

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Betting The 5

■ Breathes there a group of fig pilots gathered where the conversation didn't get around t last rat race where??? Let's finis that with some words we've hea too frequently of late: "I was pu on the pole for 7.2 G and then I his jet wash and rang up a 9.0 o meter." "That's okay, those bir are designed to take a lot more t that!"

As a pilot and an engineer, I bothered by that sort of convers I wondered how such a conclusi was reached. It seems to have c about for two reasons. First, everyone knows about the guy v pulled 12 Gs and still stayed in air; and, second, some of the jo who are a bit more technically knowledgeable have taken the tr to explain to those less knowledgeable that the *structura design engineer put a 50 percen margin of safety into the design.* last part is the kicker, and I'd li talk about that "margin of safet

Yes, structural designers do u 50 percent cushion, but it is dar important that all of you WBFPs understand just how this 50 perc figure is arrived at and how it is divided up. One way to look at as sort of a non-replenishable ra day emergency fund set aside yo ago. One day you decide to use and find that it is gone. When y ask your spouse where the mone went, she says, "I never took m than $5 at a time!" A reasonabl

* *World's best fighter pilots*

BY MR. JOSEPH F. TILSON
Structures Engineer
Directorate of Aerospace Safety

ach, perhaps, but irrelevant to
tended purpose.

fore we talk too much about the
in of safety, we need to have a
al understanding of a couple of
eering terms:

nit Load: The highest load the
is normally expected to impose.
can exceed it but, when you
ome part of the bird may be
anently deformed. It can no
r be considered "like new.")

timate Load: The load point
cted to cause complete fracture
me part of your aircraft. (This
ly is the point at which you and
bird will part company.)

e designer tries to assure the
ate load is 50 percent above the
load. There are several reasons
hy he does this but the most
tant thing for you to remember
IE DID NOT DO IT TO GIVE
A 50 PERCENT CUSHION
VORK WITH! He knows that
will be *some* intentional and
accidental overshoot when the
gets hot and you start really
ng it around up there. Part of
) percent margin of safety is
cted for that sort of thing. But,
are many other claimants for a
of the pie before you ever get
ap on the bird. Some of the real
things that eat away at the 50
nt include:

- Misdrilling of critical fastener holes.
- Tool nicks at critical fastener points.
- Improperly heat treated metal in structure or fasteners.
- Corrosion paths opened by damage to protective coatings.
- Internal (not inspectable) corrosion cracking.
- Improperly torqued fasteners.
- Structural damage induced by bending and stretching. (You know, that other jock that pulled the 12 Gs and got away with it.)
- Fatigue induced by excessive high G counts.

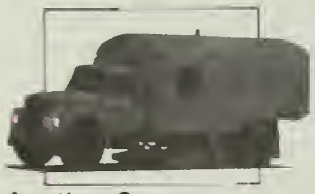
The list is by no means complete. It could go on and on. I participated in one mishap investigation where our analysis showed the actual designed margin of safety was only 23 percent. Given the usual wear and tear, the bird failed even though the pilot at the time was operating within prescribed limits.

Let me also explain something else about the structural designer. His fondest dreams are realized when his airplane is put through a static loads test and two things happen. First, the bird reaches *limit load* without any permanent deformation after the load is released. And, second (now pay attention you guys who frequently bet on that 50 percent) the aircraft falls apart catastrophically when the load reaches 1 percent past *ultimate load* (1.5 x limit load)!

Why, you ask, does he cut it so close? Well, the reason is those were the figures he was given to design to. If he actually achieved a 60 percent margin of safety (1.60 x limit load), odds are that you are going to carry around 10 percent more weight than you need. One of the best ways a designer can give you high performance is to keep aircraft weight to a minimum. Just in case, at this point, you're thinking of the new lightweight, high strength materials now available, rest assured the designer uses them also but he still keeps weight to a minimum for a given required strength! Now, what do you think about that?

No matter how you cut it, if you are one of those who bet on that 50 percent all being there for you personally to use, you are making a sucker bet. If you and your fellow jocks take good care of your bird, chances are your margin of safety will be there when you really are closing in for a kill and you need to reach down for just a little more. But, if you insist upon spending your emergency fund a little at a time, day after day, when you really don't need to, I suggest you take your money to Las Vegas. The odds are better there! ■

OPS topics



Another Sweeper

■ A sweeper was needed to clear some gravel from a runway after normal working hours. The driver dispatched "was fully qualified to operate the sweeper but had never driven it on the runway or flight line. The Base Ops dispatch crew failed to refer to existing checklists and local forms to be accomplished before releasing the sweeper to continue with his duties. The driver departed Base Ops without a radio-equipped escort or hand-held radio and made his way to the approach end of the runway. Base Ops personnel did notify the tower that a sweeper was enroute to the runway but when the tower crew requested a means of communication with the sweeper they were told to stand by. The tower crew did not see the sweeper vehicle enter the runway. It was dark and the tower is approximately 7,000 feet from the approach end of the runway. Although the sweeper vehicle is equipped with all lights required by appropriate tech orders it was not seen against the background of runway and obstacle marked lights. All vehicle lights were on at the time. A transient A-4 was beginning his final approach. In coordination with RAPCON, the A-4 was cleared by tower to continue at 7 DME. The runway appeared to be clear. At 4 DME, tower cleared the aircraft to land and the runway was checked again. The driver was clearing the approach end of the runway after each sweep across the runway. He became aware of the approaching aircraft and turned toward the tower to exit the runway. At a
mately 1.5 DME
asked RAPCON
was a vehicle on
way. RAPCON
the tower. Simulta
the sweeper's he
were spotted and t
directed a go-arou
pilot initiated a g
at 1 DME. The
cleared the runwa
second approach w
to a full stop withou
incident."

There have beer
similar incidents i
months. This is
ard we can do w
easily, by making
cedures are adeq
rigidly observed.

CAT Encounter

Clear air turbulence can still sneak up on us, as a KC-135 crew reported recently. The sky was clear and no turbulence was forecast for the altitude at which the encounter occurred. The aircraft was in a climb, four degrees nose up and 30 degrees left bank when the turbulence was encountered. The aircraft climbed 6,000 feet at 4,000 fpm, although the pilot had adjusted pitch to four degrees down. Wing roll was from 40 degrees left bank to 40 degre
Apparently there
damage to the airc
the experience wa
for the crew.

. . . What the left hand doeth

One thing that can be said for jet engines is that they'll eat anything. *Anything* includes aircraft forms left where the engine can vacuum them up. A crew discovered this the hard way when an engine compressor stalled on takeoff. After a few busy moments they got the bird back on the ground where maintenance found some 781 pages in the intake. This was a two-man operation, the kind most likely to produce such a situation. One pilot placed the 781 on the nose gear scissor door then climbed into the cockpit. Nr 2 pilot did the preflight but missed seeing the forms. There's an old saying about the right hand and left hand . . .

Gear Up

If your head is up, you may land gear up. Seems we've had several of these in the past year—which is a dumb thing for smart pilots to do. For more see "With The Whe
in the March 1980

GOING ON LEAVE

BY MAJOR ROGER L. JACKS • Directorate of Aerospace Safety

ith the advent of gasoline ages, reduced operating hours of ce stations and rising gasoline , more and more Blue Suiters eeking an alternative to the nobile when making their travel . One alternative rapidly gaining larity is travel by light aircraft. several persons or families ng expenses, it can be ntageous to rent a small aircraft our travel needs.

with any type of transportation are associated pitfalls that, if not led, can turn a beautiful vacation a nightmare. Recently, several Suiters, their families and ls have experienced this ion. Five Air Force fatalities one individual listed as missing recorded in non-USAF light aft mishaps last December alone. pitfalls can be avoided by being e of the hazards and using good nent in dealing with them.

r many years, the Air Force has gnized the value of strictly ring to proven flying regulations, g well maintained aircraft and competent pilots. In the an light aircraft world, this tight ol over man and machine is not edominant. The FAA is just as erned as the Air Force that aft are maintained and flown in afest possible manner; however, an light aircraft pilots are given ger degree of latitude in self-regulation. Some pilots take this responsibility very seriously; others abuse it.

Whether you are the pilot or the passenger of a light aircraft there are some do's and don'ts that can improve your odds of reaching your destination. It is not a comprehensive list, but rather some basic considerations.

DO

Do make sure the pilot is qualified and current in the aircraft.

Do check that the pilot had adequate rest for the flight, is not on medications and is sober! (Accidents suggest this isn't always the case.)

Do ensure the trip has been well-planned. Winds, enroute and destination weather have been checked, alternate airfields planned — adequate fuel reserves for each step correctly calculated.

Do give yourself extra travel time for winter flying conditions. Low clouds, blowing snow and icy runways can cause extended delays to your travel schedule.

Do ensure the aircraft is ready for flight, i.e., full of fuel, oil checked, surfaces clean and the craft has been cleared for flight.

Do let good judgment prevail over friendship, pride, and ego.

DON'T

Don't overload the aircraft with people or cargo.

Don't exceed the pilot's or the aircraft's limitations. Explicitly, don't fly in weather/instrument conditions when the pilot is not proficient and/or the aircraft is not certified for instrument flight. Holding an instrument rating does not necessarily mean the pilot can fly safely in weather. A pilot must be proficient in instrument flying. It's a "use it or lose it" skill!

Don't insist on trying to fly to your destination in marginal or bad weather. Have an alternative travel plan using another type of conveyance. Better late than never!! Get home-itis will buy nothing but grief.

Don't condone flight activities that you know are unsafe!

By being aware of the hazards, doing some wise planning and using some "good old common horse sense" light aircraft flying can be a fun and expedient way to travel. Have a good leave. Fly Smart! ■

G-Tolerance
a case for short pilot

■ Fighter pilots in current and future generation aircraft are destined to have frequent exposures to high +Gz during aerial combat maneuvering. Current efforts in aerospace research and development are centered around enhancing +Gz tolerance, so that pilots will be able to function more effectively while maintaining air superiority utilizing increased aircraft maneuverability. Previous reports have pointed out the hazards of exceeding one's G-tolerance.* The most hazardous outcome from exceeding one's G-tolerance is loss of consciousness (LOC). A minimum of 15 sec of incapacitation is to be expected with G-induced LOC. From our experience on the USAF School of Aerospace Medicine human centrifuge, a pilot who suffers an LOC episode may not even realize it has happened. For these reasons, it is of prime importance to ensure all fighter pilots have the best G-protective equipment and are fully trained in physiologic straining methods to enhance G/-tolerance.

The anti-G suit alone has been shown to increase G/-tolerance by +1.0 to +1.5G/. Proficient straining maneuvers can increase G/-tolerance by 2.5 G or more. Protection, wearing an anti-G suit and performing a proficient straining maneuver, therefore, can enhance G-tolerance by at least +3.0 G/. Currently recommended G/-tolerance standards minimally require individuals flying fighter aircraft to attain +7.0 Gz for 15 sec. with an onset rate of +1.0 Gz per sec. These are minimal standards, since in a true combat situation it is likely a pilot may go to higher GzZ levels for longer times and even more importantly, may utilize very rapid Gz onset rates (as high as +10 Gz/sec).

In general, Gz-induced LOC is preceded by greyout (loss of peripheral vision) or blackout (complete loss of vision), but with the rapid Gz onset rates these premonitory symptoms may not be present. If greyout or tunnel-vision does occur in flight, it is certain that LOC could be imminent. Pilots who frequently experience greyout at a specific +Gz level should be aware that they are very close to their tolerance limits, and this may even change on a day by day basis.

Several previous studies have shown an inverse relationship between G/-tolerance and the individual's height. This is not unexpected physiologically, since the vertical distance from the heart to the eye (brain) in direct opposition to the G/ vector is a critical determinant of G/Z-tolerance (Fig 1). The shorter the heart-to-eye distance, the lower the arterial blood pressure necessary to maintain retinal (eye) and cerebral (brain) perfusion. Tilt back seats were designed with this fact in mind, attempting to decrease the vertical heart-to-eye distance, thereby enhancing G/-tolerance. The M-1 and L-1 straining maneuvers are performed to increase the arterial blood pressure and therefore increase the driving pressure to the eye and brain. In addition, the muscular tensing used in these maneuvers enhances venous blood return fro the extremities to the heart. The venous blood return to the heart i important to cerebral and retinal blood flow and prevents pooling the blood in the extremities.

In the Crew Technology Divisi of USAFSAM, we have looked a parameters in addition to height which directly correlate with increased Gz-tolerance. These parameters include, in addition to shorter stature, increased age and more experience (both more flyin hours and more fighter aircraft ti These findings point out the tall, young, less experienced pilot as being most susceptible to low Gz-tolerance.

On several occasions over the years, we have evaluated individu with low Gz-tolerance. They had suffered Gz-induced LOC episode flight. Most of these pilots were t young, and less experienced and demonstrated a lower than averag Gz-tolerance as measured using a specific centrifuge evaluation protocol. In addition, they had an inadequate knowledge of M-1 (or L-1) straining maneuvers and the correct way to perform them. Aft normal aeromedical evaluation an G/-training, most of these individ were recommended for return to flying duties.

For these reasons, it is especial important for individuals with the low tolerance characteristics to ha more than the average amount of attention paid to assuring they hav full knowledge of methods to pro

*Footnote The author will furnish on request a reference list to the scientific literature regarding the facts cited in this article

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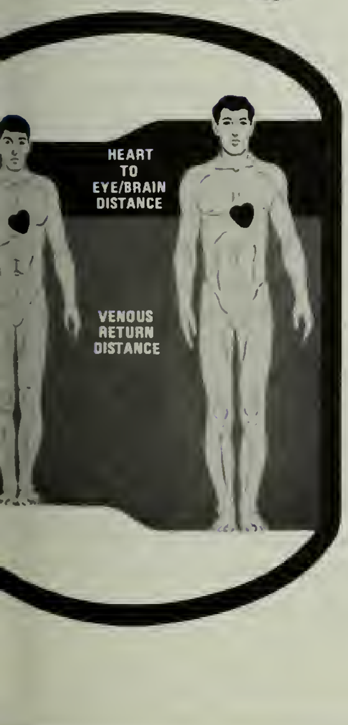


themselves against Gz-stress and are absolutely proficient in performance of M-1 (or L-1) straining maneuvers. This certainly is not to say that anyone is immune from Gz-induced LOC given the appropriate set of circumstances. Everyone should know how to protect themselves from rapid onset high sustained +Gz. This training should be very early in pilot training, since several cases of Gz-induced LOC occur in student pilots flying T-37's and T-38's. Re-emphasis of the training would be very advantageous during fighter lead-in.

Anthropometric standards for aircrew selection in general have been set to allow a safe interface between man and aircraft within the cockpit. Current USAF height limits require aircrew to be 76.0 inches (193 cm) or less. From our experience at USAFSAM, low Gz-tolerance individuals have an average height of 71.3 inches (181 cm) whereas high G-tolerance individuals averaged 68.4 inches (174 cm). From a Gz-stress point of view it seems that these height standards serve additionally to prevent putting an individual with physiologic lower Gz-tolerance in an unusually hostile environment. Waiver for exceeding height standards should be carefully considered not only in light of cockpit design limitations, but also on the basis of the inverse relationship of Gz-tolerance and height.

Many factors besides those mentioned above, influence actual G-tolerance. Since height is one factor, taller individuals should make sure they are versed in all methods to enhance G-tolerance including proficiency in M-1 or L-1 straining maneuvers. This could prevent their having a slight disadvantage during high G aerial combat maneuvering. Instructor pilots should be particularly aware of these factors when training individuals who fit the low Gz prototype making sure they emphasize G protection. Most pilots with fighter aircraft experience indicate that much of their ability to cope with G-stress comes with having regular exposure to increased G. Individuals predisposed to low G-tolerance should pay close attention to G protection if they have been out of the cockpit for a long period of time.

Short individuals have a definite physiologic advantage with respect to G-tolerance. This does not mean that taller individuals cannot compensate. It does suggest that enhancement of aerospace safety can be achieved if taller individuals are encouraged to utilize all aspects of G protection. ■

An Inspector's View Of Safety

BY COLONEL GARY R. TOMPKINS
Directorate of Inspection

■ Inspectors, like commanders and safety officers, can't take off their "hats." We deal with the problems of our Air Force everyday and begin to anticipate a worst case scenario — not always without reason. Since the solution to most of our important problems is above our pay grade or won't be fixed on our watch, and since most human errors are sure to be repeated, it is easy to become disillusioned — even cynical. We think we know what's *wrong* with today's Air Force based on our memories of the "good old days." I wonder if we can see what's *right*?

While bemoaning the state of electronic warfare, conventional weapons availability, survivability, experience levels, accident rates, realistic training/evaluation, night CAS and other such pervasive issues, I reflected back to my F-100 days in Europe in the 60s — not that long ago.

ELECTRONIC WARFARE We had never heard of RHAW or PODs (except travel PODs) — much less worked with them. We knew that SA-2s existed and planned to "avoid" them. We thought that going in low and fast would handle the rest (maybe it would have — then).

CONVENTIONAL WEAPONS We had 20MM, MK117s, NAPALM (fill your own type) rockets, a few bullpups (remember radial error? 200 feet at 12 is a bull!), AIM 9s and a super secret "kill all" weapon th few of us were briefed on — CBU Actually, we never preflighted o flew with these weapons — live o inert — except for an occasional b of outdated HEI or a one time " whiz" AIM 9 shot. There was n dash 34 checklist and we didn't know a fahnstock clip from a fan belt. We did train well tactically the time). We dropped MK 76s (version of the BDU 33; for you heads) and MK 106s; however, release parameters were based on how close you could get to the ground without fouling — who ca about frag patterns?

SURVIVABILITY We had unpainted F-100s lined up on the ramp ala Egypt in '67. Maintenan could never hack it if the jets we dispersed — right? We had gas ma gold visors (stored in the safe), e patches and pistols which we dutifully showed inspectors. We got some tear gas in the squadron test our mask donning. But it was obviously unsafe to try to operate with the masks on — anyway, leth gas was against the Geneva Convention and we'd nuke 'em if they used it — right? I had heard atropine in UPT and I suppose w had some stored somewhere. We the TAB Vee tests and discovered that base camouflage made it hard find the runway and aircraft camouflage made night flying impossible, or so we thought.

OW EXPERIENCE LEVELS ld a first lieutenant flight nmander, captain ops officer and ior sq commander (though ortunately, not at the same time). course, it took a lot longer for motion then (e.g., 7 years to iporary captain). Very few erienced troops came over – there s a PACAF Air Force, a TAC Air ce, and a USAFE Air Force. st of our captains (about 80 cent) left the service when they S'ed (retention isn't a new word!), l we received bright young guys to lace them. They were highly ected (50 percent UPT washout ; assignments based on class nding) great stick and rudder men, l *very* aggressive. Then came the eads – FAIPS, B-47 crews, old ids (sound familiar?). Funny thing, y taught us judgment.

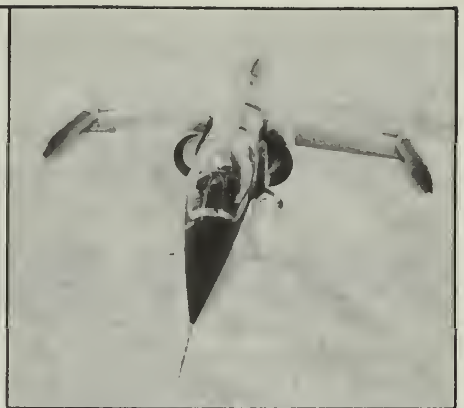
HIGH ACCIDENT RATES Our ıadron had missing wingman, bys on my first four Saturdays on base. Great way to introduce the nily to the Air Force! We lost 25 cent of our squadron pilots the t year doing such combat-relevant neuvers as high G rolls under a) foot ceiling and flying under wer lines. We worked hard to get major accident rate below 20 per),000 hours for the F-100 fleet but er made it. Of course, we had no hooks (at first), rocket ejection ts or sophisticated electronics. ither did we have to worry about a ar environment. We went controlled through IMC (it's a big , isn't it?) in a "local area" ich included most of the itinent. We found two smoking es by searching the route of the ssing low level MAPs. I stopped ınting when 44 of my close ociates bought the farm between 53 and 1968. The last year was nbat; however, the line between a nbat loss and an accident was zy, indeed.

REALISTIC TRAINING/ ALUATION You bet! In spite of rules. Of course, DACT was catch-as-catch-can with no tape recorder or debriefs to figure out why the Mirage III ate you for lunch. ("Energy maneuverability curves" were still to be developed.) CAS was an "impress-the-Army" exercise. If you timed the burner light just right . . . Strafe was the biggee; our four-man NATO team averaged 96 percent. How effective it was against a T-54 tank was not the point. ORIs were actually fun – after the first day! We went to the range and filled a gunnery meet square. Of course, there were all those nuclear safety/release rules but no base "attack," "enemy" fighters or any of the rest.

NIGHT CAS You must be kidding! By '65 we had heard of the Night Owl tests in Florida; however, our night flying consisted of a tour of the NATO capitals at 30,000 feet. We did practice MISQUE (an early version of ASRT) for a while; accuracies of a few miles were achievable.

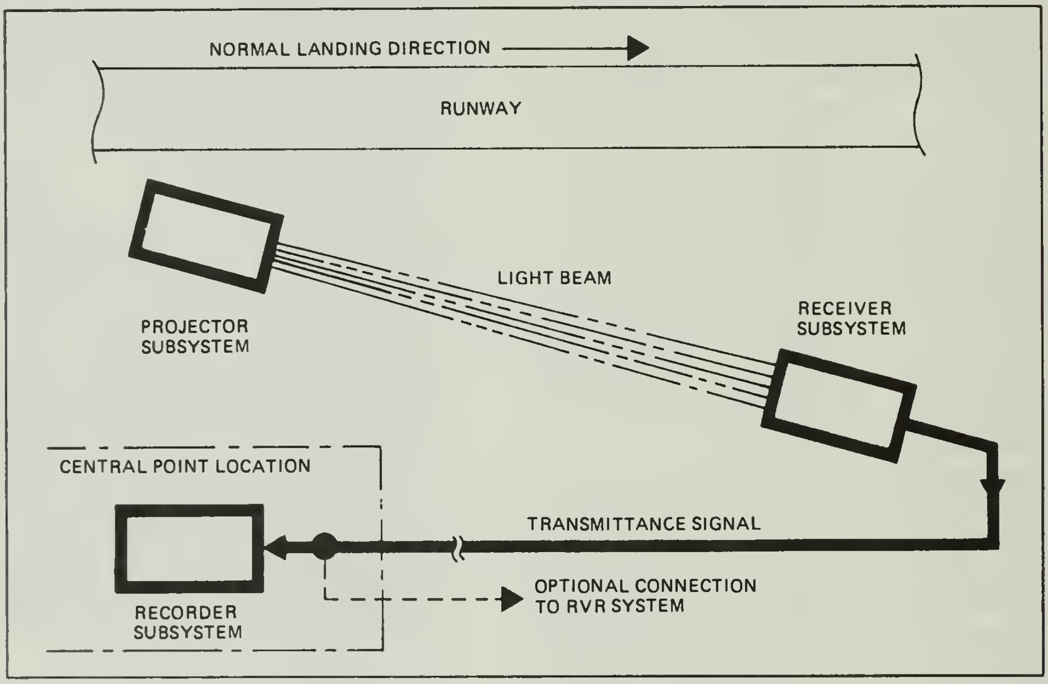
We have certainly come a long way in the last 15 years, and yet a lot really hasn't changed. The ethic and spirit of squadron life; the importance of flight leadership; endless briefings and additional duties. The basics are just as important as ever. The problem is that we're playing in a different league with different rules. Against today's requirements we may have slipped a bit.

There are real world, important issues for us to work. Nevertheless, it's constructive to reflect on the progress we've made and pat ourselves on the back, occasionally. It may not hurt to help the new banner carriers – and ourselves in the process – place the current turmoil in perspective. ■



Visibility, Safety and You

BY MSGT FREDERICK N. ROTTET
3350 TCHTG/TTMW • Chanute AFB, IL



■ Pilots know that visibility is one of the more critical aspects of flying safety. But how many of you are familiar with how visibility and runway visual range are defined and measured? We'll take a look at these terms, discuss how the visibility measuring sets do their thing, and point out some of the capabilities and limitations of the system.

First, the definitions. What exactly is visibility and how is it different from runway visual range (RVR)? Visibility is defined as how far you can see and identify prominent unlighted objects by day and prominent lighted objects by night. For example, being able to see a tree or building against the contrast of the sky. It's a different matter for night situations, when your reference is that of being able to see a 25 candlepower light source. But visibility by itself doesn't take into account the effect that the runway lights have on a pilot's ability to see. Obviously, brighter runway lights let you see farther. This is where RVR enters the picture. RVR represents the horizontal distance a pilot will see down the runway from the approach end. It is based on the sighting of either high intensity runway lights or on the visual contrast of other targets whichever yields the greater visual range. RVR, in contrast to prevailing or runway visibility, is based upon what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range, not slant visual range.

The figure shows the basic siti
and components of a visibility
system. A constant-intensity bea
light is projected towards a recei
unit which is either 250 or 500 fe
away, depending on installation.
a very clear day, the receiver pic
up the maximum amount of light
is adjusted to display a 100 perce
reading. Any subsequent reductio
the clarity of the air reduces the
amount of received light, and thu
the percentage displayed. This ra
percentage needs to be corrected,
because the receiver may be pick
up light from sources other than
projected beam. How much
"background" light you have ca
found by momentarily turning of
light source. Then you subtract t
amount of "background" from y

nal reading, and the result can
onverted into actual visibility
g a set of tables.
is whole process can be time-
uming, and the possibility of
is always present. To convert
percentage to an RVR reading, a
rent set of tables for each
ay light intensity setting must be
ulted. To top this off, there are
rent sets of tables for day and
!
overcome these problems, an
computer was developed in the
60's. A common item at many
, this small digital set goes
gh essentially the same
edure as a human operator. It
natically turns off the light
e, measures the background
being picked up by the receiver,
stores the result for future use. It
turns on the light source, allows
tensity to stabilize, and
ures the raw visibility.
ground is subtracted from the
during this phase, and the
cted data is cross-referenced to
nally-stored conversion tables.
computer even knows whether
ay or night outside, and knows
bright the runway lights have
set. The RVR value displayed
ntinuously available and is
ted every 51 seconds. Every
of ten readings is automatically
ged, rounded off and displayed
ow trends. The computer warns
perator when the RVR falls
v field minimums, when an
ss amount of background light is
nt, or even if the visibility set
bonkers and puts out an

abnormally high reading!

Sound good? In a way, it definitely is. It can be a more accurate system and is fully automatic, and can certainly relieve a weather specialist of a time-consuming chore. But to get maximum benefit from the data, you have to be aware of the limitations of the system. After all, it's not human like you or me.

First, this visibility set (called a transmissometer) is situated near the end of the runway and adjacent to it. Although dual transmissometers are frequently installed, single systems still exist. But no matter how many you install, they can't be everywhere. Hopefully, a site is selected that is representative of the whole runway area, but some bases have weird phenomena. Thus, you occasionally have a situation where the transmissometer is in clear air and the rest of the runway is rotten! Local pollution, blowing dust, the town dump, the steam plant and a chaotic barbecue can mess up the best of systems.

Second, the light source and receiver units are mounted on metal stands, so that the measurement occurs approximately 14 feet off the ground. If your cockpit is that high, as it is on larger aircraft, you have no problem. But if you're in an A-37 and the layer of ground fog is 10 feet thick, you might be in for a surprise. Certain types of haze and pollution can do just that sort of nonesense, and sometimes nobody notices until you are ready to touch down.

Finally, there are some accuracy limitations in the system itself. The transmissometer loses effectiveness below 1,000 feet, and at the other end of the scale, above 6,000 feet. For example, a 96 percent reading at night converts to 7.0 nautical miles visibility, and a 97 percent reading converts to 9.0 miles. A 99 percent reading jumps up to 20 miles, so the relationship of percent to miles is not uniform. For this reason, the RVR computer is programmed to display a double-minus sign (− −) below 1,000 feet and a double-plus sign (+ +) above 6,000 feet. Visual observations and direct readings must take the place of computed RVR values on either end of the scale.

Well, gang, does this mean that you take all visibility reports with a grain of salt? Definitely not. The equipment works quite well, the operators are dedicated professionals like yourselves, and the equipment technicians are notorious for keeping the equipment operating at peak efficiency. But being familiar with the system can make the data more meaningful to you and make you a safer, more effective pilot. ■

About The Author

MSgt Rottet is a veteran of 20 years in the Weather Equipment career field, and has spent 13 years of that time in various instructional capacities at the Weather Equipment School, Chanute AFB, Illinois. A graduate of the ATC NCO Academy, MSgt Rottet holds an Associates degree in meterological equipment technology through CCAF and a Bachelor of Science degree in career occupations through Eastern Illinois Univeristy. He is currently the Career Development Course writer for his career field, a subject matter specialist and a technical writer.

It Really Does Use Monkeys And Mirrors

BY CAPTAIN JIM DAVIS • 89th Flying Training Squadron • Sheppard AFB, TX

■ When an aircraft was lost due to a fuel system malfunction, there were few experts who could do other than quote the existing tech orders. As these tech orders proved inadequate, it became evident that a new look at fuel transfer system malfunctions was in order.

So, what follows are some little known secrets of the T-37 fuel system. The T-37 being a ubiquitous airplane, its fuel system idiosyncracies should be of interest to many pilots in several commands. The author wishes to acknowledge the considerable assistance of Major Pat Flanagan, who is currently studying at the Air Force Institute of Technology.

Let's get to the "who dun it" first and then fill in the details later. Under a fuel starvation situation, with rpm between 70 and 80%:

- The fuel boost pump warning light will illuminate 22-25 seconds prior to flameout.
- Near full scale, fuel flow fluctuations will occur approximately 5 seconds prior to flameout.
- The left engine will flameout first, followed immediately by the right.

Flameout will be quick and sudden with no noise or noticeable roughness.

Now, the really sharp ones among you are clamoring, "What about the telltale rise in fuel quantity which precedes flameout?" No doubt your mind is recalling dim memories of how air on the fuselage tank fuel probe causes the fuel quantity to increase— indicating a problem long before the boost pump light comes on. WRONG, JP-4 BREATH. That is an old wives tale and nothing more. The fuel quantity will rise but not because of what you might expect.

Let's start from the top. While there is little doubt that Orville and Wilbur may have dreamed up the fuel system, it is basically a solid design. Here is how it works.

- There are capacitance probes all three tanks.
- The fuselage tank probe is density compensated.
- There is no fuel quantity transmitter.

What exists is similar to a Wheatstone Bridge based on capacitance. (See Fig 1) As total decreases, the capacitance on the three probes change and the syste continually attempts to balance its through the use of a variable capacitor (the fuel quantity gauge) When you check the fuel in a wi tank, you move the selector switc This mechanically substitutes a dummy capacitance load for the o two tanks, isolating them from th system. The system balances itsel through the variable capacitor (fu quantity gauge) and, voila, you h the amount of fuel remaining in t selected tank.

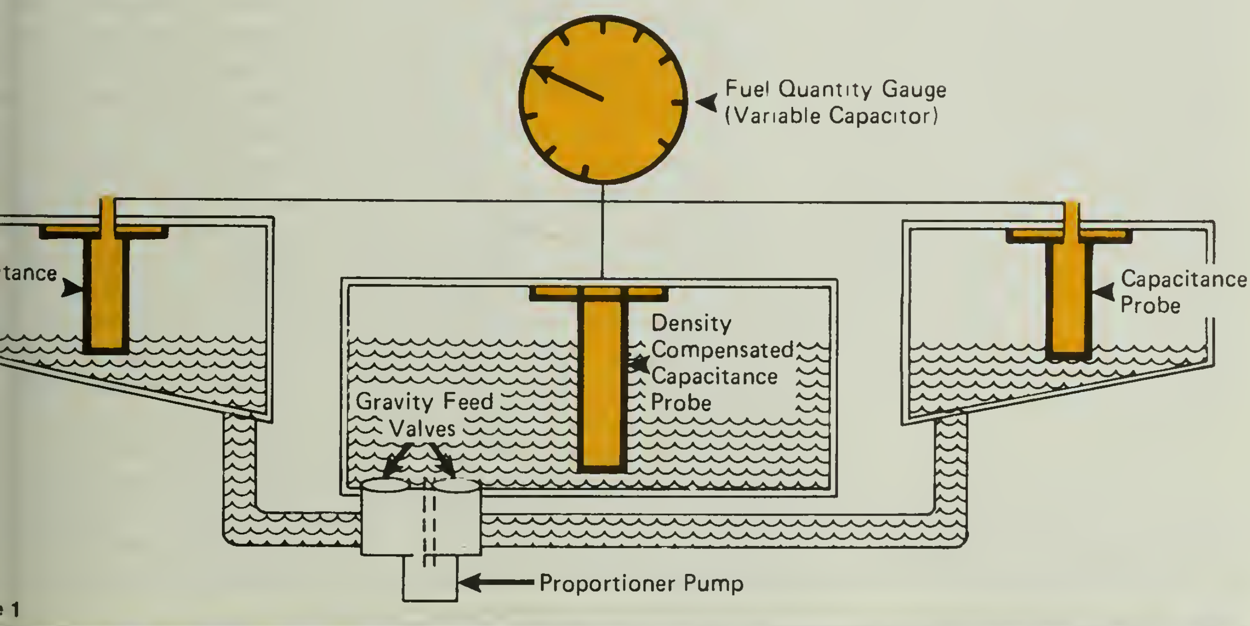
t what about this rise in fuel ity prior to flameout? Yes, nia, it does occur. But not at all e reasons you had thought. The of the erroneous increase is not the probe. This is a normal rence. Rather, it is based on the hat our type of Wheatstone e is designed with the nption that the fuselage tank has st 400 lbs of fuel in it when is fuel in the wing tanks. out this situation, the "bridge" nes unbalanced and the fuel ator goes bananas (similar to ing a number by zero). That's ood news, now the bad. The ase can be as little as 100 lbs or ich as 600 lbs and can begin 5 to 15 minutes prior to out. Further, it may take the 5 to 15 minutes for the rise to . As you can tell, this would not be very noticeable. The best warning is an unusually high fuel quantity indication rather than the actual rise.

So what? As everyone knows, it will take a double failure of the fuel system for a no-notice flameout, due to fuel starvation, to occur. WRONG, AGAIN. Another old wives tale. Let's start with what you've been told all these years.

In the fuselage tank there is a float switch package that consists of three sections. The top section contains the high level float switch. The middle section contains the mid level float switch. The bottom section contains the low level float switch and the fuel low level warning switch.

Here's how it works. Start with a full fuselage tank and begin to burn fuel. As the fuel decreases to approximately 415 lbs in the fuselage tank, the mid level float switch turns on the proportioner pump and replenishes the fuselage tank from each wing equally. Fuel increases until the level reaches approximately 565 lbs where the high level float switch turns the proportioner pump off. This continues until the end of the mission when the wing tanks finally become depleted. At that time, the fuel quantity continues to decrease below 415 lbs. The proportioner pump turns on yet there is no gas in the wings to transfer into the fuselage tank. The fuel quantity continues to decrease. At 380 lbs ± 20 lbs, the level of the fuel reaches the low level float switch. Here several things happen:

- The proportioner pump is turned off.
- The gravity feed valves open, turning on the gravity feed light.



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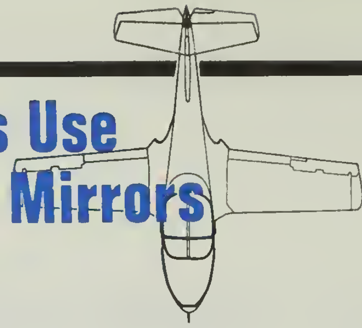
It Really Does Use Monkeys And Mirrors



continued

■ The fuel low level warning light is turned on.

From this final warning, you have approximately 30 minutes till flameout. A quick check of the options (Fig 2) shows that an unannounced flameout can occur under the following conditions:

■ Both the mid level and low level float switches malfunction.

■ Both the low level float switch and the proprotioner pump malfunction.

Let me introduce some new information. There are two types of float switch assemblies in the T-37. (Fig 2) One type has two floats and the other has the three floats (which you were led to believe all along). In the two-float assembly, one float controls the high level switch and the other controls BOTH the mid level and low level switch. A failure of this bottom float and you lose not only your normal replenishment system but you also lose your emergency backup. Let's rock the apple cart one more time. Aircrews have no way of knowing which float switch assembly is installed in a particular aircraft. The stock number of each is identical. One estimate has it that the two types are evenly distributed throughout the fleet. Now you are looking at not a double failure but rather just one sticking float that could have you enjoying a nylon letdown.

On the brighter side, the mean time between failures of the float switch assemblies is over 2,000 hours. Both types fail at approximately the same rate.

It Just Isn't Your Day

Let's say that you have one of those failures that will lead to a no-notice flameout. Clearly, it will show up on your regular 15-minute fuel checks or a level off check, or a before descent check, or an approach to field check. But let's say you've been preoccupied and didn't get around to such trivial matters. The first thing you notice is the boost pump light illuminating. Your memory of the Dash-1 brings a Warning to the front of your head.

WARNING

If the fuel boost pump warning light has illuminated due to fuel starvation in the fuselage tank, continued engine operation is questionable regardless of how rapidly corrective action is taken. Depending on altitude, consideration should be given to immediate initiation of

EMERGENCY AIRSTART procedure.

The boost pump light has illuminated due to fuel starvation. This occurs because you've got air between the boost pump and the boost pump pressure sensor. This slug of air will guarantee that your engines will flameout; but, the T-37 has a pretty rugged engine. For if you select Fuel System — Emergency and Starter-Air, that slug of air will be followed by more fuel and the ignitors will be firing. You have an excellent chance that the flameout will be brief and the engine will immediately restart.

Before you get carried away w this sure-fire cure-all, another WARNING comes to mind.

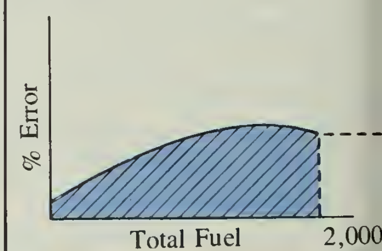
WARNING

If double engine failure is experienced at or below 2,000 feet AGL, immediate ejection is advisable.

And again, ejection should not b delayed below 2,000 AGL in fut attempts to restart the engines.

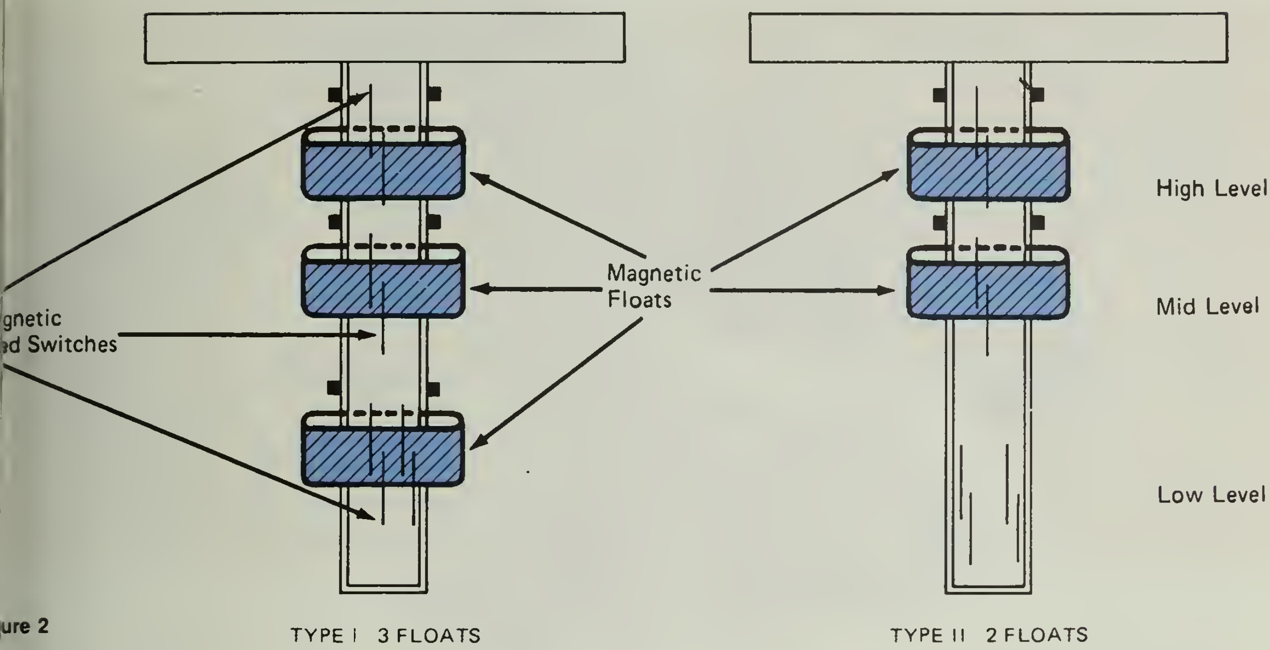
First The Monkeys

Two other items come to mind somewhat related topics. The firs concerns the accuracy of the fuel gauging system. A check with th people at Honeywell (who design the system) yields up the followi chart.



Although the graph is not to s it shows two useful points. First, error in the system is at its great the high end of the scale, indicat approximately 8% low. At the lo end of the scale, the error becom significantly less. In fact, the err proportional to the amount of fu the wing tanks and is exaggerate the pitch attitude of the aircraft. as the fuel decreases to the point where it is all in the fuselage tan the system is most accurate. Tes have shown that as the fuselage nears depletion, the percent erro decreases significantly. As with high end of the scale, the percen error is negative, indicating less than is actually on board. Good for those of you who routinely f 1.9.

FLOAT SWITCH ASSEMBLIES



ure 2

w The Mirrors

The last topic that I want to cover one that caused a bit of nsternation a few months ago. The uation went something like this:

> While returning from an out base at cruising altitude, a crew encountered boost pump failure as indicated by the fuel boost pump warning light. A check of the fuel total and balance showed all systems, except for the boost pump, working normally. They selected Fuel System — Emergency (gravity feed) and continued the mission heading home. At about 680 lbs total fuel, the fuel low warning light illuminated. Checking the fuel distribution, they found the fuselage tank with 380 lbs and each wing tank containing 150 lbs. They suspected trapped fuel, yet observed the wing tanks to feed normally.

They and you have been taught that gravity feed should keep the fuselage tank full. WRONG, AGAIN. Take another look at Figure 1 and then compare it with Figure 1.9 of your Dash-1, page 1-12. They don't agree. Check Figure 1 again for the position of the wing tanks and the gravity feed valves. Putting things in this perspective, their situation seems quite normal. Not quite. I've heard from a lot of would-be-test-pilots who tried to duplicate this situation with mixed results. Here are a few facts that will help put things in their proper perspective.

- Start with positive pressure in the wing tanks from the wing tip vent valves.
- Add the one-way valves between the six fuel bladders in each wing.
- Toss in a bit of occasional turbulence and uncoordinated flight. Add all these together and the gravity feed will do what you've been led to believe all along. The moral of this episode is: After you've identified a boost pump light as a boost pump — and not a fuel transfer malfunction — return the switch to Fuel System — Normal.

Oh, yes, If you have a rare situation like the one above, don't expect the last drop of fuel to leave the wings until total fuel decreases to 226 lbs.

Finally, a disclaimer. Although the information in this paper is correct, it is not exhaustive and is not a substitute for the existing tech orders. They should be considered accurate until changed. I hope you have learned a little more about the indestructible Tweet and will continue to search for answers. As the system ages, the mysteries will increase. ■

RED FLAG Lessons Learned

BY SENIOR AIRMAN PETER J. CARROLL • Det 2, 3636 CCTW (ATC) • Nellis AFB, NV

■ Red Flag exercises, conducted at Nellis AFB, Nevada, are the testing grounds for many of our tactical systems, equipment, and procedures. Detachment 2 of the 3636th Combat Crew Training Wing is a part of the gamut which makes up the Red Flag exercises, its survival instructors accompany and monitor the performance of every aircrew member who acts as a survivor in the Red Flag Search and Rescue (SAR) exercises.

The SAR scenarios are written to maximize the realism for both the survivors and the rescue forces, as well as other participating aircraft. The survivors choose their own course of action without guidance from the Det 2 instructors.

One of the major roles of the instructor is to compare the actions of the survivors to various "school solutions" which are taught at USAF survival schools and during continuation training. From these comparisons, an analysis is being conducted to determine if the problem areas are a result of insufficient emphasis during survival training, insufficient continuity of continuation training, or inapplicability of training to a realistic environment.

This article addresses several of the problems which have recurred, on a frequent basis, and points out some techniques which may reduce potential future problems.

Evasion Survivors very often fail to apply proper evasion/ camouflage procedures considerin the tactical environment created b the SAR scenarios. Tracks are a c giveaway to the enemy. By failin exercise proper discretion for the desert environment, many survivo leave obvious tracks which are ea followed in the loose desert soil. These tracks can be avoided by us hard or rocky ground and by maki use of available vegetation. One method is to step or slide the foot beneath available bushes or shrubs conceal tracks.

Route Selection and Movemen A consistent problem for survivor the route they select for travel. In desert environment, rapid moveme walking in the open, and skylining

king on the crest of hills or
s) can attract unwanted tion. Additionally, traveling the ary crest in desert areas can t in the survivor being seen. By g available vegetation and nages and slowing the pace, the ivor can move from one ealing bush to another, greatly cing the chances of being cted.

ocation Determination (Map Compass Use) Survivors have culty relating the map to the unding terrain. Identifying marks, interpreting contour lines, nting the map, and triangulation observed as frequent weak areas. essential for a survivor to know position in relation to the nearest cted Area for Evasion (SAFE) and Forward Edge of Battle a (FEBA). Additionally, many ivors do not know the procedures activating the SAFE areas. TE: Aircrew members should k their intelligence shops he correct activation procedures.

gnal Mirror Past experience in rt SARs has proven the signal or to be an invaluable tool for cting rescue aircraft to the ivor's position. Yet, a great y of the survivors are unable to ze this device with or without ing the directions. Many ivors also have difficulty in ing the bright spot which is used irect the flash toward any given ct. Some find it necessary to tice with the mirror, ghtlessly flashing nearby terrain, exposing their position to the ny.

ompass Vector When using a pass to vector an aircraft to the ivor's position, most of the lems are caused by a lack of lanning by the survivor. ivors do not take the time to tify references for cardinal ctions and therefore are unable to vectors to recovery forces on t notice. Another problem is that some survivors use vectors when simple turns would have been more effective.

Two basic concepts have become apparent at Red Flag. First, it is not always advisable to vector rescue forces directly over one's position during the location phase. It is often better from a safety standpoint, especially the survivor's safety, to vector the rescue aircraft to a holding point some distance away to where a mirror flash can be directed. Another concept is that if the survivor takes the time to locate references for the four cardinal directions prior to the arrival of rescue forces, he can generally provide adequate and reliable directions if he disregards the compass heading and directs the SAR aircraft simply to "come northwest."

Security Many survivors do not anticipate an English-speaking enemy nor do they consider that the enemy may have automatic direction finder (ADF) capability. When the survivors communicate over the transceiver, their transmissions are too lengthy and they are easily deceived by the simulated enemy, who can confuse both the survivor and the recovery forces. This results in unsuccessful recoveries and shootdowns. Survivors sometimes unknowingly transmit valuable information to the enemy when they are talking to rescue forces. Additionally, enemy forces may attempt to deceive the survivor and convince him that they are the rescue forces.

Authentication Problems associated with survivors using improper authentication procedures were discovered shortly after the first Red Flag exercise, and an increased emphasis is now being placed on authentication at the survival schools. In the meantime, the aircrew member should consider reverse authenticating the rescue forces before volunteering any sensitive information to them. (Example: "Rescue, what is the sum of the last two digits of my SSAN?")

Directing Strikes Known enemy positions are of extreme importance to any incoming friendly aircraft. Such information, when passed effectively, will reduce the chance of any further downed crewmembers. Very often this information is available to the survivor but is not passed along to the rescue forces. At the time information is needed most, survivors are busy with many distracting duties such as radio operation, concealing themselves, and picking up equipment; however, omitting this information could bring disaster to what can be a successful rescue.

The majority of survivors give away their position prior to rescue. Doing this enables the enemy to choose several courses of action such as surrounding the survivor and waiting for rescue forces to attempt his extraction, then shooting down those forces creating more survivors who will need help, and so on.

At Red Flag, we have been fortunate to observe many a successful rescue, but we have also observed a significant number which may have been unsuccessful if the threat had been real. Increased emphasis on tactical environments during both formal and continuation training may be of substantial benefit in reducing the frequency of observed problems. One point seems to stand out, at least to the observers of Red Flag: *Many of the problems result from the survivor not being prepared for the rescue forces to arrive.* By mentally reviewing all of the actions which may be asked of him, in particular, signaling, vectoring, and communicating, the survivor will greatly increase his chance of a successful rescue. ■

Unchained

■ Everybody knows that a chain is only as strong as its weakest link. In the safety field we look for such a weak link since mishaps are caused by a chain of events all linked together. Take away one link and there is no mishap. Well, the only link that was missing here recently was a distance of about 75 feet between a landing F-4 and a SOF truck on the runway.

To set the stage for this near-mishap (and a reported HATR). SAC operates at our base as a tenant unit to the host F-4 wing. Working relations are good, and the two flying operations normally run smoothly side by side. But in any operation there is always room for the unexpected (AKA "Murphy") to occur.

Here's what happened.

The SAC SOF was parked in his vehicle alongside the TAC RSU when the TAC RSU Officer (RSO) came up to the truck. He asked the SOF to drive him onto the active to remove an F-4 drag chute which was on the runway and holding up their flying activities. When the SOF said okay, they both drove toward the taxiway, and the RSO informed the SOF that the runway was restricted to low approach only (500 feet AGL).

As they approached the active, the SOF called Tower for clearance. Tower cleared him on to the active, and stated "F-4 on final, restricted low approach." As they drove down the active toward the approach end, they could see the F-4 — three miles — two miles — ONE MILE!! "HEY, I THINK THIS GUY IS GONNA LAND!!!" The SOF truc took a sharp left and got about 60 feet from centerline when the F-4 touched down practically abeam the truck and on the opposite side of th centerline — that little distance between your reading this here and reading about it in a Class A misha report.

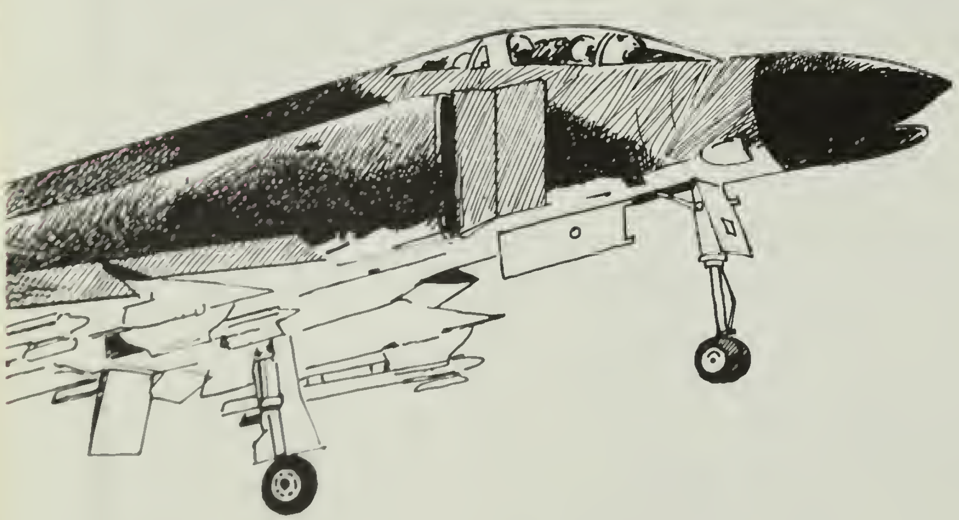
But let's look behind the scenes all the little murphies that allowed a mishap to almost happen.

The F-4 was returning from the firing range where a "beeper" had tied up the Guard frequency. He turned it off and simply forgot to turn it back on.

The approach was being flown by the GIB for training, and the radar controller handling the approach wa a trainee.

The aircraft was high and to the right of course when the pilot took control at three miles and 1,000 feet He had planned and requested a full stop and was now concerned that, due to his position, he might not be able to complete the approach to landing. He decided to disregard further controller instructions and fly it visually.

It was about this time that the Tower notified PAR of the clearance for a restricted low approach,



Melody

How to Amost Run Over Your SOF

CAPTAIN JOHN W. McGEOUGH, JR.
MW FSO
mour Johnson AFB, NC

hicle on the runway,'' and they red the SOF truck on the active. AR relayed the clearance to the There was no response.

Vhen the tower controllers ized that the pilot might try to l, they broadcast go-around ructions over Guard, and PAR n gave him go-around ructions.

he pilot acknowledged neither of e (he couldn't hear tower) and pleted his approach and landing. ically, the only other individual might have been able to send around — the RSO with his flare — was out of position on the way!

f we analyze some of the above ons, one thing is evident. The t was so intent on taking control n the GIB and getting the plane n — ''landing fixation'' — that he totally oblivious to any other munications about him. And n though he never actually got a rance to land, he had asked for . Not hearing (or rather prehending) any instructions to contrary, he assumed he had ived a clearance.

urning to PAR, there is room to ond-guess their actions also. trollers will sometimes request nowledgment of a CHANGE IN CLEARANCE from the pilot — but not always. Here we didn't even have a change, since landing clearance was never issued! And since it was not required, the controller did not press the pilot for an acknowledgment.

PAR did notice that the F-4 had gone below the 500 foot restriction. However, they took no action since their interpretation of a ''Restricted Low Approach'' is ''500 feet above the field, *at the runway threshold*.'' It had not been uncommon for pilots to go below that altitude on an approach and then climb up to it before the runway threshold. By the time Tower started calling go-around instructions and PAR picked it up, the pilot was so intent on landing he heard nothing.

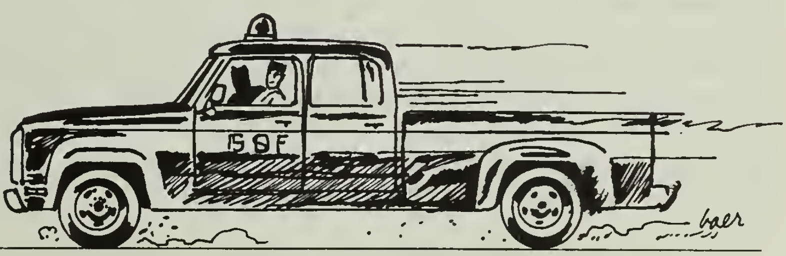
The restricted low approach concept is addressed in neither AFM 51-37 nor TERPS. This is important because if we have no specific definition we will have only interpretations — and these can be dangerous. Is it a decision height or an MDA? And should the controllers notify the pilot if they observe him going below the restricted altitude?

Another area we second-guessed was the tower. They cleared the SOF truck on to the active when the F-4 was three miles on final. They assumed he had received, understood, and would comply with the instructions relayed by PAR. But is that good enough? Is it safe enough? Perhaps it would help if the tower must have a confirmation by the pilot acknowledging the restricted low approach (to either the Tower or Approach Control) before they clear anybody else on the runway. And perhaps PAR should request acknowledgment anytime a clearance out of the ordinary is given to an approaching aircraft.

So what have we learned from the above? That the whole episode was a simple case of a pilot landing without clearance? WRONG!

Everyone of the factors (or Murphyisms) stated above is a link in that chain of events: Guard turned off; RSU unmanned; failure to receive an acknowledgment from the pilot; landing fixation, etc. None of them by themselves are barnburners, but when they all link together you have all the fixin's.

How strong are the links at your base? ■



A Personal Review

When Squadron Leader Peter A. Barratt of the Royal Air Force left his job of publishing the RAF's *Transport Aircraft FS Summary,* he summed up some of his experience concerning flying safety. We think his words make a lot of sense, so we are reproducing portions of his editorial from *Aerospace Safety,* June 1978.—Ed.

■ Let me begin with a rhetorical question—what is Flight Safety? I believe that we should not have flight safety, per se, at all. None of us, except for the occasional psychopath (and I trust that we have none of those) sets out to kill, maim or injure himself or his professional colleagues. It therefore follows that we aim for safety in our daily round, whatever that daily round might entail. It further follows that, for those of us whose daily round is aviation, our primary unstated objective is flight safety.

It has become somewhat fashionable to make "airmanship" the preserve of those who actually get airborne. I disagree; I believe that it is in making this mistaken assumption that we have been forced into creating a generic name such as flight safety. For me, flight safety is simply good airmanship; conversely, airmanship is the practicing of good flight safety principles. The two are as inextricably linked as to be one and the same thing. As an island race we have always depended upon the sea, and our sea-faring traditions go back a long way. Perhaps that is why, with only three generations of airmen, airmanship is far from being on a par with seamanship. And yet I believe it should be. I would like to suggest that we take a leaf out of our nautical brothers' book and instill a spirit of airmanship in all those who have any dealings with aircraft—if you like an "air-in-the-bones" philosophy in lieu of "salt-in-the-bones." We could then dispel any idea that flight safety was a subject in its own right with its own mystique and we could put airmanship back where I believe it properly belongs—in the cockpit, on the flight line, in air traffic control, amongst the support personnel and so for[th;] in short, with all those whose job is associated [with] putting aircraft in the air.

A few months ago I wrote . . . about the reason[s for] putting men, rather than machines, into cockpits [and] onto flight decks. Even as I did so, I realised that I [was] not stating the whole truth. I stated that the advanta[ges] that men had over machines was in their adaptabil[ity,] their flexibility and their analytical approach to proble[ms.] And yet we are in danger of replacing those adapta[ble,] flexible and analytical men with "mechanical" men [who] merely follow the book by rote. Already we have s[een] accidents caused by a blind adherence to FRCs (fl[ight] reference cards [checklist]) rather than a systematic [ap]proach to the problem. You may be lucky, your em[er]gency may appear in FRCs, but on the other han[d it] might not. Certainly, the secondary effects of any m[al]function and any action you may take can only be kno[wn] by understanding the systems and logically think[ing] the problem through. Think up "new" emergencies [for] yourself and follow then through; try them in the si[mu]lator if you have one. Every one to which you h[ave] given prior thought is one less with which to be ta[ken] unawares. Once again this is all airmanship—I beli[eve] we must bring back the man who is capable of log[ical] and intuitive thought; we cannot afford automatons [in] our cockpits. . . .

AIRCREW HAVE FINAL RESPONSIBILITY

Let me now turn to one of the specifics of the fli[ght] safety world—aircrew error. To err is human, as we h[ave] often been told, and I cannot see anything that [will] radically alter man's fallibility. Aircrew error has beco[me] a very emotive issue. It is the aircrew who have the fi[nal] responsibility and, more often than not, it is the aircr[ew] who also have the unenviable task of trying to sort [out] the situation when it is all going to worms. But we ha[ve] become too accustomed to shooting the pianist e[ven]

n the piano is out of tune or when the score is wrong. ply because the accident situation occurs at the l man-machine interface (i.e., pilot-aircraft) we ıld take more care before we rush in and blame the ı. Conversely, when the pilot is skillful enough to ue a situation that was not of his own making, we ıld be much more ready to heap acclaim upon him. hermore, I would like to extend this argument to e other members of the chain referred to earlier.

irtually every accident has a human cause. The ıan error can occur when the specification is written, n the specification is turned into a design, when the gn is turned into metal, when the product is tested, finally when the aeroplane is put into service. Even the human error can be made by any one of a thou- l people involved in the aircraft operation, its main- nce and all its other support services. Fortunately, ı stage acts as a cross-check, seldom is any one man ıg in isolation and, furthermore, we impose a system ontrols and feed-back loops, all of which serves to ıinate the potential accident. However, we know ı experience that, however small the mesh, sooner ıter one will still slip through the net. Even then the dent may be avoided because its potential may be gnized in time and the appropriate remedial action n. However, the human-being will continue to show limitations — limitations in perception, limitations nderstanding, and limitations in reaction and imple- tation. No, let us think twice before shooting the ist, seldom will he not have been giving of his best ı if his best still costs us an aeroplane. On the other l, any breaches of discipline should be dealt with tly so the distinction can be made more easily by e on the sidelines.

AT IS FLIGHT SAFETY?

rhaps we should return to the current definitions of t safety at least as we see them in the Royal Air e. The aim of Flight Safety is the reduction to a mum of human and material losses due to aircraft lents. The chief reason for an active pursuance of a policy is simply because we can ill-afford either type of loss. Accidents erode our already overstretched finances, they eat into that intangible called morale, and furthermore we have an accountability to the general public who want their money used for their defence rather than for us to throw it on the scrap-heap.

AS PROFESSIONALS WE TAKE PRIDE

Having said that, I believe that few, if any, of us are actually conscious of these factors in our own flight safety philosophy. I said it earlier but it bears repetition — none of us actually wants an accident to occur. The real accident prevention motivators, I believe, are such things as the value we put upon our own and our colleagues' lives, and, furthermore, as professionals, we take a pride in doing the job to the best of our abilities. But it is in this same area where all too often we fall down. As members of the aviation community, flight safety is part of the community spirit. Only a few of us are assigned to fly the aeroplanes but all of us have a responsibility for their safety. It is a small air force these days and when an accident occurs the word travels fast. Often we will know the pilot or a member of the crew. Some of us will look at the cause and say — "I thought that would happen some day" or "That almost happened to me, but . . ." How many people to whom it nearly happened or who thought it would happen actually told someone about their experiences or their fears? Where was their sense of community spirit? Are their consciences clear when the question is asked "Could this accident have been prevented?" Sometimes to voice our thoughts in this way will necessitate an integrity of the highest order. Sometimes to do so will be to appear foolish to our peers and our masters alike. But surely our sense of community spirit can overcome that, surely our commitment to aviation is bigger than that, and just as surely our peers and masters must respect our appearing foolish for the great degree of moral courage it really is. If ever a climate is engendered that tends to keep our mouths sealed we must do all we can to break those seals. A prerequisite of flight safety is commu-

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A Personal Review continued

nication and in an age of ever advancing communications, it is sad to see us performing so badly at the simple art of communicating. By failing to communicate, all we can be sure of is that we are, in effect, condemning a friend or colleague to death. And when the tragedy occurs, those of us who had the knowledge which could have prevented it, but kept it to ourselves, are as the perjured witness, the crooked judge and the biased jurors in a bogus trial leading to the execution of the innocent. . . .

FLIGHT SAFETY . . . WHERE IT BELONGS

Let us, therefore, abolish flight safety and recreate airmanship. Let us put flight safety back where it belongs in our personal approach to our jobs. Do pass on your good ideas all the time, not just when we visit, for not to do so is a form of complacency. Let us recognize that, for as along as men are part of aviation interface, we have human error accidents, but let us not shoot pianist simply because he produces cacophony r than harmony. Let us open up our own hearts and s they contain any useful pointers towards the causal fa of accidents and then let us tell someone of responsi to tell us of their mistakes so we may forewarn ot Finally, let us take the broader view so that we all tribute to a learning curve for our profession in toto r than each having his own. . . . ■

AREA NAVIGATION PRIMER

■ ". . . The aircraft knows where it is at all times. It knows this because it knows where it isn't. By subtracting where it is from where it isn't (or where it isn't from where it is—depending on which is greater) it obtains a difference or deviation. The area navigation system uses deviations to generate corrective commands to drive the aircraft from a position where it is to a position where it wasn't; consequently, the position where it was is not the position where it isn't. In the event that the position where it is not is not the same as the position where it originally wasn't, the system acquired a variation. (Variations are caused by external factors, and the discussion of these factors is not considered to be within the scope of this report), the variation being the difference between where the aircraft is and where the aircraft wasn't. If the variation is considered to be a significant factor, it, too, may be corrected by the area navigation system. However, the aircraft must know where it was also. The 'thought process' of the system is as follows: because a variation has modified some of the information which the ANS has obtained, it is not sure where it is. However, it is sure where it and it knows where it was. It subtracts where it should be where it wasn't (or vice versa) by differentiating this from algebraic difference betw where it shouldn't be and whe was, it is able to obtain the d ence between its deviation its variation, this difference b called error."—Douglas Se Magazine Nov/Dec 78, by wa TWA *Flight Facts* Aug 79. ■

F-4 Rollers: wheels, tires, brakes

COL HORST GAEDE, GAF
rate of Aerospace Safety

e Air Force has come a long so has the F-4 Phantom. To that air machine predictable it's on the ground and give it a h ride, we installed a landing nd subsystems like wheels, nd brakes (not to mention the heel steering) — things I want about in this article.

king at the statistics, we were vays too satisfied with our 'goodies." Over the last , we destroyed or extensively ed four airplanes on the l due to tire/brake failures, directional control and running runway. We "graded" r three mishaps under the B file and, last but not least, d hundreds of Class C's. We ved considerably, however, he last five years, bringing the d mishaps down from about 40 5 to less than 20 for 1979. ilures (sometimes hard to e from brake failures) are from 49 (1975) to 12 (1979). were lucky not to lose an e for one or a combination of ve failures for over three now, but let's face it, the al is there! And, you could be t one to run into it. So, read t's look at some of the ns that we've got and what to

eels The F-4 MLG wheels olding up pretty well over the but signals are they don't last . Prior to 1979 there were ne or two isolated failures that were attributed to heat damage or machining defects in the lockring groove. Otherwise, the current configuration wheel has been trouble-free.

An on-wheel tire gage will assist in keeping proper main gear tire pressures.

Over the past 12 months, however, there have been 28 deficiency reports. Of these, 14 failed on the aircraft, and the other 14 were found in the NDI shop. All failed wheels were manufactured between 1971 and 1974. If the current trend continues, we should see about 20 fatigue failures this year. But wait, don't get frightened all the way! The item manager and commands are well aware of the situation and an improved inspection method has been introduced to condemn the bad ones early enough. Additionally, it looks like all wheels are going to be replaced as they reach 10 years of age. The wheel itself probably will not change since the current design is still considered optimum for the operational envelope. Besides that, it might make you feel better to know that these kinds of failures generally occur at taxi speed, because that's when they are subject to the highest stress. So, let's keep 'em rolling!

Tires Tires don't last forever, either. But tires are usually changed before they can hurt you. Still, we have had times when tire failure rates were overall unacceptable, each of them bearing the potential for a run-off-the-runway situation. Anyway, today's "Goodyears" can be taken for the best you could probably ask for, and even retreads are found to do their job.

The primary tire failure mode, therefore, is considered to be underinflation, a condition almost impossible for you, the aircrew, to detect (even crew chiefs have a hard time doing that). In order to cope with the underinflation problem, you can expect a permanent on-wheel tire gage to be added to the main landing gear wheels. This gage is presently designed, or, better, redesigned, and when installed will provide a good means of ensuring adequate and equal pressures inside your

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F-4 Rollers: wheels, tires, brakes continued

"rubbers" before you take your bird up into the sky.

Brakes/Antiskid Provided wheels and tires are in good shape, you still want to have a good selection of braking options on hand to keep you on the "straight and narrow" in more than one way. True? After all, it took some years to upgrade "big ugly" with the "state-of-the-art" Hydro-Aire Mark III Antiskid System, but you've now got it!

It provides several distinct advantages over the old Mark II, namely touchdown protection and crossover locked wheel protection. In addition, the Mark III System exhibits better reliability, simplified maintainability and shorter stopping distances. From the standpoint of pilot "feel" the new system differs little from its predecessor except that the sensitive pilot will probably notice a greater smoothness. Brake pressure is controlled more closely and modulated at a level which maximizes aircraft retardation force.

What the system won't do for you? It won't prevent hydroplaning. Differential braking still results in longer landing rolls. And, be assured that all engineering genius and black boxes cannot replace your pilot skill and judgment once the wheels are on the ground.

Talking about that, I don't consider it very smart to step on the brakes in order to check 'em out right after touchdown, when still at high speed. Some folks seem to have a habit of doing so, at least that's what you read in the mishap reports. Fact is, that braking effectiveness is reduced with increasing velocity. Particularly with a "smooth" system like the Mark III the reduced braking effect, at let's say 150 knots, could easily be misinterpreted as a system problem and a wrong course of action could result (off with the antiskid, down on the pedals again and boom— goes the tire!). Furthermore, many brake operators don't realize how little pedal deflection it takes at 150 knots to lock a wheel if the antiskid is not functioning as advertised. As little as one-quarter inch may already be too much under some conditions. So, why take a chance on ruining your day by getting into the blown tire-directional control loss-depart the runway game? Let the drag bag do the job for you when speed is high (that's when it works best, by the way). Slow down below 100 knots if at all possible before you check the brakes. A malfunctioning antiskid won't hurt you then because it takes almost maximum system pressure at that speed to skid a tire. Should you at that point find out that there any brakes, you still have plent time to go through your proced

Keep "big ugly" straight, g down the hook, come off the b before you select the emergenc brake system. Those things are strong but touchy. There is no to blow the tires now, and afte you still have a cable or two w for you.

To make a long story short: Mark III antiskid is a well desi reliable system, capable of controlling landing roll and sto distance of your bird. Use it w but be prepared for malfunctio Expect the unexpected! There still many things which can go (and they will now and then). faulty valve could block off br pressure, a speed sensor could installed improperly or malfun a little wire could be broken.

Sometimes the ANTISKID INOPERATIVE warning light not tell you the true story.

To summarize again what y do to avoid surprise from your "rollers":

Check your system thorough preflight (tire condition, wire a connectors, brake stacks, emer brake lever position, etc).

Plan on using all runway av for your landing roll.

Know your procedures and plan of action prepared in you ahead of time.

Happy landings! ■

Four F-4 Class A mishaps in 10 years have resulted from tire/brake failure.

Fatigue In Aviation Operations

BY CDR ALAN STEINMAN
Special Medical Operations Branch
United States Coast Guard

Fatigue can be operationally ned as a condition characterized deterioration in skilled ormance resulting from the ibined effects of physical, siological and psychological sses. Such a definition avoids the t, narrow usage of the term nd in scientific literature and ead permits a discussion of the dition in the total context of the tor and his environment. Many ors contribute to the development rew fatigue: sleep loss, physical tion, altered work/sleep cycles, dom, anxiety, task saturation, hypoxia, discomfort, ydration, hypoglycemia, recent sses, emotional problems, etc. se factors can be present vidually or in various binations. The important element ughout is a resultant degradation rew performance.

he signs and symptoms of fatigue into three general areas: (1) rements in psychomotor tions, manifested by decreased dination, inappropriate aircraft rol inputs, etc; (2) Narrowed ntion span, manifested by tting steps in sequential tasks, re to completely scan ruments, fixation of attention on ngle item to the neglect of others, (3) Acceptance of a lowered dard of performance, manifested lecreased concern for flight ty, "cutting corners," increasing ccupation and distraction by or discomforts, irritability, etc.

he treatment or relief of fatigue ssitates correcting each of the ipitating factors. Often times, however, the symptoms are reversed by a sudden change in performance requirements. An in-flight emergency, for example, may, for a brief period, eliminate all signs of fatigue, allowing the crew to function at or near their pre-fatigued capacities. The same phenomenon may occur in preparations for a difficult landing or in other psychomotor skills requiring a brief period of maximum performance. Eventually all of the relevant physical, physiological and psychological stresses must be relieved before fatigue can be completely alleviated.

Fatigue can be further subdivided into acute and chronic states. Acute fatigue usually implies single mission performance degradation, and it is manifested by any or all of the symptoms listed above. A common precipitating factor in acute fatigue is participation in a mission during normal sleeping hours. Such an upset in the working/sleeping cycle creates a physiological stress which is often compounded by accompanying physical stresses, as may be found in foul-weather operations, wearing a tight wet suit, etc. Chronic fatigue is the accumulation over a long period of one or more stress factors without adequate time for recuperation. Sleep loss and psychological stresses are often the most precipitating factors. In addition to causing the typical signs and symptoms of fatigue in its own right, chronic fatigue lowers the threshold for the development of acute fatigue among air crews.

Broadly defined in this manner, fatigue is probably the most common factor in pilot caused aircraft accidents. This is particularly true in Coast Guard operations where instant response capabilities are maintained throughout the day and night. Crew rest regulations offer only partial remedy to the problem, since these regulations address only a few of the possible precipitating stress factors. In order to minimize the effects of crew fatigue on aviation operations, aviation personnel must be continually aware of its potential, must be frequently reminded of its manifestations, and must be willing to admit that occasionally they are fatigued and hence are unable to perform to safe standards. Ultimately the responsibility for minimizing fatigue and maintaining maximum performance rests with *each* aviator and aircrewman. This supposes that all aviation personnel are familiar with the causes, signs and symptoms of fatigue in general and with fatigue's specific manifestations in themselves, unfortunately this is rarely the case. Therefore the problem of fatigue will always be a part of aviaiton operations, and will always be a major item of concern for flight surgeons and for flight safety officers (and Commanding Officers – Ed). – Courtesy DOT Coast Guard *Flight Lines.* ■

Mail & Miscellaneous

Send your ideas, comments and questions to:
Editor, *Aerospace Safety* Magazine, Norton AFB, CA 92409

PW ARTICLE

■ In response to Mr. William E. Hardy's article (PW: Encounters of the Worst Kind) in the January issue of *Aerospace Safety*, I would like to relate some observations based on my personal experiences as a PW.

The training received in our survival schools can, in fact, save your life. Not just in learning how to survive in the forest, the jungle or the frozen wastes of the north, but in learning how to cope in a situation that seems endless in a war that is fought 24 hours a day, every day for years: captivity.

When I went through the PW portion of survival training many years ago at Stead AFB, I entered a phase that was to be repeated for real less than a year and a half later but would last considerably longer than those three days of training—in fact, it lasted almost seven years.

My initial interrogation in Hanoi was quite similar in many ways to my first round of interrogation at Stead. The first few months were just like survival school—only for real. During initial interrogation sessions the North Vietnamese grilled me for and got unclassified military information, the validity of which was highly questionable, but satisfied their demands. Interrogation sessions a few months later and the events surrounding them are an example of what Mr. Hardy talked about in his article.

One by one, the men in my camp were pulled out and asked to write a war crimes confession. Eventually it was my turn, and my immediate reaction was to say no. For the next couple of hours, the interrogator and I talked about it as he attempted to appeal to my intellect. After that time, I was put in a side room and told to think about it as I sat on a cement stool while a guard watched me.

By late afternoon after thinking about it for almost eight hours, I was called in and again asked to write. I politely—yes, politely, because one gains absolutely zero from being antagonistic—answered no. That answer infuriated the interrogator, who then called in two of the guards to administer the punishment he had promised earlier in the day if I refused to write, as I had just done. I had called his bluff, but very quickly was questioning the wisdom of that decision. The guards forced me on to my stomach, pulled my hands behind my back and up around my shoulder blades. One cuff was placed on my wrist and tightened down as tight as humanly possible. The other handcuff was twisted and applied to the other wrist cross-wise. In this position it would cut into the sides of your wrists. This cuff was also cinched down as tight as possible. To ensure this (to get the cuff as tight as possible) the guard stood on it to apply as much pressure as possible. In this particular position if you relax your arms and start to drop them to the small of your back the twisting of the cuffs causes the cuffs to cut into your wrist, causing excruciating pain. I was then placed back into the side room with the cement stool and told not to move. They had a guard watching me most of the time. Whenever the guard

was not there I would use a table the room to lie on my chest so that arms could rest on my back and lease some of the pressure. I co only do this for a minute or two si the guard continually monitored n Several times I was caught stand up and the guard would come in a slap me around. After three days feet had swollen to the point tha could not see my ankles. My har

like balloons. They would take out periodically and ask if I had changed my mind and would write, say no. On the next day, after I declined to write, the guard took piece of rope and tied each end e my elbows and tightened it my elbows touched. I was still e cuffs. I was placed back in the room on the cement stool. Six with no sleep; I passed out, hit floor and opened a gash on my . The noise brought the guard was mad because I was not in sitting position. He came in and n to knock me around. I agreed to write a statement of apology for bombing in North Vietnam.

It wasn't what they wanted, but they got a statement, and I was really feeling low. I felt, as Mr. Hardy said, that I might have "avoided" that statement had I "resisted harder, longer," even though I had resisted and didn't have the attitude of Bill Hardy's Missourian who did not resist.

What I'm saying is, even when a PW has resisted "to the utmost of his ability" there can be a conflict within oneself. My conflict was relieved, however, when I realized that if they want something badly enough, they can get it—but make them work for it and don't hand it to them on a silver platter.

Let me leave you with something I tell audiences that listen to my experiences and who say they could never do what I did. "Never sell yourself short; you don't know what you can do until you have to do it."

(Drawings are based on originals supplied by Cmdr Gerald L. Coffee.)

Jerry D. Driscoll, Lt Col, USAF
AFISC/SEF
Norton AFB, CA 92409

R BARRETTE

have enjoyed your magazine for 20 years. It is a valuable management tool for Ops frogs and maintenance toads.

ust wanted to bring to your attention an observation that is becoming evident with the increased influx of females into the maintenance force. I direct your attention to the back cover of the Jan 80 issue of *Aerospace*. A female is shown launching an aircraft, which is okay, but, in her hair is a large barrette. Not only is this a violation of the uniform wear reg, it is a definite potential for FOD.

I realize that the photo credit was given to the USN *Mech* magazine. Is it possible that the Navy needs some FOD awareness training?

Keep up the good work in producing an excellent magazine.

Donald D. Stockhoff, CMSgt, USAF
Quality Assurance Superintendent
Griffiss AFB, NY

E ON HAIR BARRETTE

y pals and I were reading the Jan issue of *Aerospace Safety* and dering if the maintenance type on back page really typifies safety a hair barrette on the flight line nd operating F-4 aircraft in violation of AFM 127-101, para 8-24. Thanking y'all.

SMSgt Buck Schlum Bohm
(960MS Maint Super)
4718 Edgemont Dr., Abilene, Texas

You sharp-eyed devils! Thanks for keeping us on our toes. We'll try to do better.–Ed.

'VE COME A LONG Y NAV!

ngratulations on your excellent azine. While it is directed toward ew operations, many of the safety iples illustrated can be, and are, ed to ground safety.

an old Nav myself I enjoyed ain Riolo's article "You've Come ng Way Nav!" (Sep 1979). Unmy memory is failing faster than uld like, I believe Captain Riolo it have better luck DRing for n in the North Pacific than in the h Pacific. Probably it was just a graphical error.

Please continue your excellent work.

Lt Col Richard W. Money
Commander, RBS Det 1
1 Cmbt Eval Gp
La Junta, Colorado

ERRATA

Reference the article "Fuel Density," *Aerospace Safety*, January 1980, page 23. The values for BTU gal in the chart are in error. They should be 118,989 for JP-4 and 125,594 for Jet A.

THE ORDER OF DAEDALIANS

The Order of Daedalians, the National Fraternity of Military Pilots, will conduct its 46th Annual Convention on 5-7 June in the Del Webb's Towne House at Phoenix, Arizona.

The presentation of five prestigious awards will be the highlight of the final evening's Awards Dinner. The Air Force Reserve has been selected to receive the Major General Benjamin D. Foulois Memorial Award (Flying Safety) which is the oldest of these awards. Senator Barry Goldwater will be the guest speaker. ■

MAJOR

Gary A. Matthes

6512th Test Squadron
Edwards Air Force Base, California

■ On 9 November 1979, while Major Matthes was taxiing back to parking from a ground abort in Last Chance, the number one and number two brake systems failed when he attempted to slow down. At idle power the F-16A will taxi in excess of 50 knots without brakes. Approaching a Y-intersection, Major Matthes turned left to parallel the parking ramp, shut down the engine and started the jet fuel starter. However, when he shut down the engine the main generator dropped off the line and he lost nose wheel steering. The aircraft turned toward several aircraft parked on the ramp. Major Matthes then restarted the engine to regain nose gear steering, and did a tight right 270 degree turn narrowly avoiding the parked aircraft. While notifying the tower of his problem, Major Matthes proceeded to the middle taxiway and out onto the runway for an arrestment, but the tail hook failed to lower. Major Matthes then skillfully maneuvered his aircraft into a clear area between the ILS antenna and the runway approach lights, using nose gear steering, and shut down the engine so the aircraft could coast to a stop. No damage to the aircraft or airfield and related equipment was incurred. The skill and quick actions of Major Matthes saved a valuable aircraft and prevented personal injury. WELL DONE! ■

☆U S Government Printing Office. 1980—683-214/7

TATES AIR FORCE

Well Done Award

esented for
ıding airmanship
professional
rmance during
ardous situation
nd for a
ant contribution
to the
States Air Force
dent Prevention
Program.

CAPTAIN

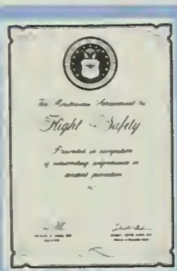
Terence L. Casteel

7575th Operations Group

■ On 12 October 1979 Captain Casteel was scheduled for a local pilot proficiency and low level terrain following mission in an MC-130E. All preflight checks and takeoff were normal until just after lift off when Captain Casteel was forced to use full right aileron to maintain wings level flight. Right turns were possible only with large rudder inputs; however, left turn could be made by releasing right aileron input and using coordinated left rudder. Captain Casteel directed a visual scan of the flight controls and flight control hydraulic booster packs and was informed that both ailerons were deflected upward. An emergency was declared and a left hand pattern flown to a successful landing. Postflight inspection revealed that the left aileron actuator linkage had not been reconnected after maintenance was performed in the left flap well area. Through skillful airmanship and prompt analysis of the situation, Captain Casteel performed the proper steps in handling an inflight emergency: Maintain aircraft control; Analyze the situation and take proper action; Land as soon as conditions permit. With the application of these sound principles in a timely, expert manner, Captain Casteel successfully landed the aircraft. WELL DONE! ■

1979 USAF SAFETY PLAQUES

The Safety Plaques are awarded for outstanding safe achievement and mishap prevention in four areas: Fligh Explosives, Missile and Nuclear Safety. Recipients retain permanent possession the plaques.



FLIGHT SAFETY

AAC
21st Tactical Fighter Wing

AFCC
1866th Facility Checking Squadron

AFLC
Sacramento Air Logistics Center

AFSC
Detachment 27, AFCMD, AFPRO, General Dynamics

ATC
12th Flying Training Wing
47th Flying Training Wing
71st Flying Training Wing
323d Flying Training Wing
557th Flying Training Squadron
Officer Training School

AFRES
94th Tactical Airlift Wing
913th Tactical Airlift Group
917th Tactical Fighter Group
928th Tactical Airlift Group

MAC
71st Aerospace Rescue and Recovery Squadron
Detachment 5, 38th Aerospace Rescue and Recovery Squadron
62d Military Airlift Wing
76th Military Airlift Wing
314th Tactical Airlift Wing
375th Aeromedical Airlift Wing
435th Tactical Airlift Wing
436th Military Airlift Wing
443d Military Airlift Wing, Training
463d Tactical Airlift Wing

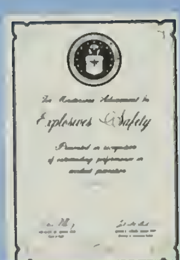
NGB
109th Tactical Airlift Group
116th Tactical Fighter Wing
154th Composite Group
170th Air Refueling Group
188th Tactical Fighter Group
191st Fighter Interceptor Group

PACAF
3d Tactical Fighter Wing
18th Tactical Fighter Wing

SAC
6th Strategic Wing
28th Bombardment Wing
42d Bombardment Wing
97th Bombardment Wing

TAC
1st Tactical Fighter Wing
1st Special Operations Wing
24th Composite Wing
31st Tactical Fighter Wing
57th Fighter Interceptor Squadron
347th Tactical Fighter Wing
479th Tactical Training Wing
507th Tactical Air Control Wing
552d Airborne Warning and Control Wing
602d Tactical Air Control Wing

USAFE
26th Tactical Reconnaissance Wing
32d Tactical Fighter Squadron
86th Tactical Fighter Wing
601st Tactical Control Wing



EXPLOSIVES SAFETY

AAC
21st Equipment Maintenance Squadron

AFSC
Air Force Weapons Laboratory

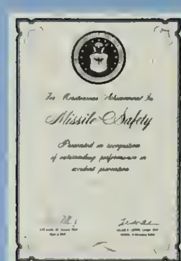
AFRES
919th Special Operations Group

NGB
123d Consolidated Aircraft Maintenance Squadron

PACAF
15th Air Base Wing
18th Tactical Fighter Wing
51st Composite Wing (Tactical)
400th Munitions Maintenance Squadron (Theater)

TAC
33d Tactical Fighter Wing
67th Tactical Reconnaissance Wing
366th Tactical Fighter Wing

USAFE
20th Tactical Fighter Wing
48th Tactical Fighter Wing
406th Tactical Fighter Training Wing
513th Tactical Airlift Wing



MISSILE SAFETY

AAC
5010th Consolidated Aircraft Maintenance Squadron

AFSC
Eastern Space and Missile Center
Western Space and Missile Center
Armament Division

MAC
2d Weather Squadron

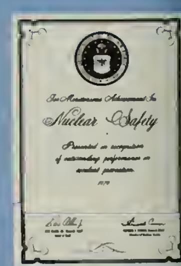
NGB
144th Fighter Interceptor Wing

PACAF
3d Tactical Fighter Wing
51st Composite Wing (Tactic

SAC
5th Bombardment Wing
28th Bombardment Wing
42d Bombardment Wing
319th Bombardment Wing
44th Strategic Missile Wing
91st Strategic Missile Wing
351st Strategic Missile Wing
381st Strategic Missile Wing

TAC
33d Tactical Fighter Wing
57th Fighter Interceptor Squa
84th Fighter Interceptor Squa

USAFE
52d Tactical Fighter Wing
401st Tactical Fighter Wing



NUCLEAR SAFETY

AFLC
3097th Aviation Depot Squad

MAC
6th Military Airlift Squadron

SAC
28th Bombardment Wing
44th Strategic Missile Wing
91st Strategic Missile Wing
416th Bombardment Wing

TAC
Detachment 3, 425th Munitio Support Squadron
366th Tactical Fighter Wing

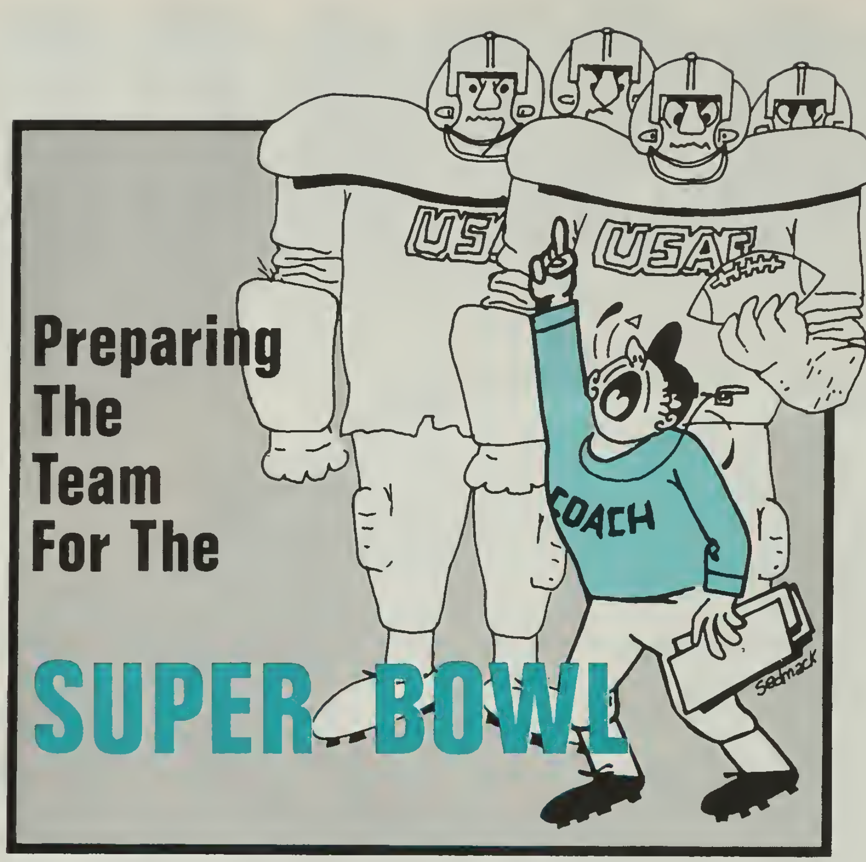
USAFE
20th Tactical Fighter Wing
52d Tactical Fighter Wing

AEROSPACE

TY • MAGAZINE FOR AIRCREWS JUNE 1980

FIGHTER INSTRUCTION • Thunderstorm Avoidance

a Bigger Thumb —high performance and warp speeds • **Suds Duds** —foaming falls flat



Preparing The Team For The SUPER BOWL

By COLONEL GARY R. TOMPKINS • Directorate of Inspection

■ On the surface, the goals of readiness and safety appear to be mutually exclusive. But, are they?

Realistic training to meet expanding mission requirements in today's threat environment has inherent risk. Some tradeoff decisions between force preparedness and "acceptable" risk are inevitable; they must be based on how imminent we perceive combat to be, and against what odds, in what place, and to meet what objectives. Resource protection – people and equipment – is equally important in peace and war; attrition unrelated to an *achieved* objective is equally abhorent in each. Yet losses will take place if we're serious about meeting the objectives of either.

In some respects, the apparent dichotomy between readiness and safety can be equated to the problem faced by a pro football coach at the start of the season. The owners demand a winning team, and so do those of the competition. The player selection process is over except for the final cuts, the injury losses, and those pulled up from the reserves. You know what the old heads could do *last* year, and you know what the rookies – trained against different standards – could do in a different league.

The front office has set the budget, and your resources are finite – only a few deep in most positions. Your scouts give you a feel for the competition, but you know you must adjust your game plan as their – and your – strengths and weaknesses are demonstrated. Most of the players are in good physical shape, but few are game-ready. Some old heads hope to rely on past experience, and some new heads aren't prepared for the rigors ahead; you must determine how to train and motivate them all.

As a coach who has been through previous league playoffs, you know what it takes to win. You also know that if you push too hard, too fast you'll commit the worst possible Needlessly injure the players in exhibition game or, worse yet, scrimmage – neither of which coun league standings. You also know everything done – short of a ma injury – to improve conditioning, instill the basics, to learn the plays know the competition, to build p sonal confidence, to create team sp and to stimulate judgment and flexi ity will get the best out of what have. It takes drill and more drill to it right; but, too much will burn th out, increase injuries, and peak th on Wednesday instead of Sunday.

Our "games" of course, are scheduled; we could be called to p any day. We hope that enemy scout watching our scrimmages will adv their coaches to postpone the challe match week after week. To k game-ready, we employ a surrog enemy (e.g., aggressors), drill specialty teams, occasionally p exhibition games with the wh team(e.g., Red Flag), and have e been known to play in the mi leagues (and perhaps learned so wrong lessons). Our owners, howev insist we remain in the big leagu only super powers play in the Su Bowl.

In preparing for the game we h won't come, we work on new a tougher tactics, buy new and exp sive equipment, and try to learn fr those who played in games t counted. Many of those old – and so old – heads retire from the act rolls or are transferred to the front fice and leave the training of the yea influx of rookies to those they the selves have trained. They remem many bright young faces who soon the field grimacing in pain. They f personally responsible for not prep ing them better – showing them h to survive. And yet, they feel equa as strong about having a winni team.

Fortunately for their peace of mi they know that those they have taug to survive and forced to learn t basics will have a better chance to p in future games – and win them.

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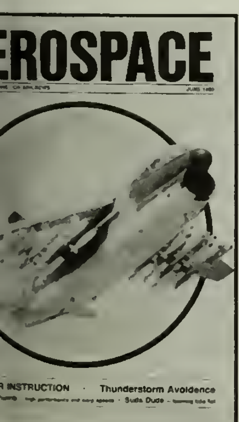

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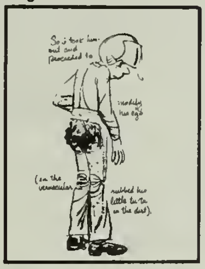

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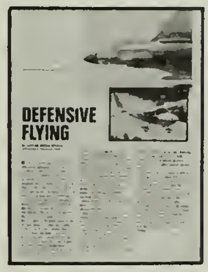

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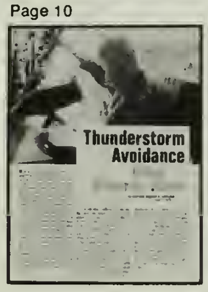

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Get A Bigger Thumb

■ **Question**
In the aircraft you currently fly, how many Gs can you pull without causing structural damage?
Answer
If you responded with a nice firm number like, 8.5 or 7.3, you probably allowed yourself to be conned into spouting the aircraft maximum operating G for a clean aircraft at low combat operating weight. To give a correct response to this question first requires an answer to a series of questions as follows:

What weight?
What airspeed?
Symmetric or unsymmetric maneuver?
What stores are on board?
Where are they positioned?

Most WBFPs* develop thumb rules about things like these. Those with small thumbs limit their effort to memorizing the highest value shown in the Dash One under operating limits. These are the guys who think the F-4 is an 8.5 G aircraft and the F-15 is a 7.3 G aircraft. You F-4 drivers, how many times have you been in a rat race below 37,500 lbs gross, clean configuration, below .72 Mach, and wanted a nice, clean, no-rolling pull-up? Probably never, and yet that is the only time you are allowed 8.5 G. Even if you were clean, 37,500 lbs gross and .72 Mach, just adding a roll to the pull reduces the max allowable G to 6.8.

Before we go farther, we need to have a basic understanding of two very important terms. These are:

Symmetric Maneuver A pitch maneuver where the wings are equally loaded by the lift produced from the changing angle of attack.

Unsymmetric Maneuver Everything else. Any maneuver which introduces a rolling or yawing motion.

You guys with the little thumbs should remember that for any maneuver which involves simultaneous roll, you must reduce the allowable symmetric G by 20 percent. If you refuse to accept this, and you are an F-15 driver, then you are going to bring your bird home with tiny wrinkles in the upper wing skin. Perhaps before finding these wrinkles, you should read "Betting the 50" in *Aerospace Safety*, May 1980.

Now, let's move on to things for the big thumbs. When a 40,000 pound aircraft pulls 7 Gs, symmetrically, the wings are actually carrying a load of 280,000 pounds. In a symmetric maneuver, each wing is expected to carry half the load.

However, when the pilot comma roll, the aileron on one wing de down producing a higher angle attack and additional lift on that If 7 G symmetric was the design load for this aircraft, the wing v already loaded to its maximum, roll has caused that wing to exce design capability, and it goes ho with a funny shape.

"Then why can't the designer me a 40,000 pound 7 G rolling capability," you ask? He could, his airplane comes out so heavy his proposal never wins the cont and he winds up designing plast models for a toy company. On t remote possibility that some misguided soul buys his airplane new operator's voice would join song about the aircraft that "goe down fast, up slow, and takes th counties to turn around."

* World's Best Fighter Pilots

R. JOSEPH F. TILSON
ures Engineer
orate of Aerospace Safety

this point, I hope you are g to accept as fact that the roll uver greatly increases the load e wing. Check your Dash One ou'll see that references to roll usually assume very modest (e.g., 120 Deg/sec).

day's aircraft have max roll rate ilities far greater than that. The r the roll rate, the more severe ading. If any of you should pull num symmetric G and then add num roll rate, you would be advised to make sure your nal affairs are in order so as to nize the confusion for your ident survivors.

w for some heavy stuff that will oth thumbs and maybe even the one (some Marine Jocks I used with were all thumbs).

l you know that even though you ithin weight and airspeed, you not be able to pull max G? The imiting factor you must consider configuration of external stores. ylons and even the stores elves are not necessarily ned to withstand max G loads. You need to study the Dash One to find out which limit goes with which store. Failing to do this may result in your having to fill out a Dropped Object Report, followed by an engineering analysis report that says, "There was no evidence of fatigue or stress corrosion; the pylon support failed due to structural overload." (That means *you* did it!)

Now for you F-16 jocks who think your angle of attack limiting system protects you from an over-G goof—think again! No matter what is hung on your F-16, the angle of attack limiter treats your aircraft as though it were in a clean configuration. If you have external stores aboard, you are going to have to drag out your trusty thumb to be sure. There is a similar system under development for the F-15, but it will be several years before you see it in your aircraft. However, this new system, like that in the F-16 system, may not cover you all the time.

So, until such time as Darth Vader returns to threaten the intergalactic social order, you will have to study the Dash One with professional care and develop some rules of thumb which you and your beautiful flying machine can live with.

It would probably be helpful if each squadron conducted a seminar to develop some simple, meaningful thumb rules for operating its assigned aircraft within limits. Unfortunately, most offensive and defensive maneuvers are unsymmetrical and reduce the G limits. Maintaining energy means keeping the Mach up, and that further reduces the G limit. It just seems like you can't win. None of us is naive enough to believe that you are going to be thinking about weight, airspeed, unsymmetrical maneuvers, or what's on the outboard pylon when you are pressing in for the kill, or worse yet, the number 2 WBFP is closing at 7 o'clock. What we really hope you try for is a general reduction in *unnecessary* over-G occurrences. That way the odds are better that your flying machine will take all the abuse you give it should the real need occur. ■

On Fighte

By **MAJOR GARY L. SHOLDERS**
Directorate of Aerospace Safety

■ *You are about to be treated to another installment in the continuing saga of Bear's Theory of Fighter Aviation. You know, I've heard tell that some of you folks out there are not happy with some of my more outrageous statements that have recently appeared in print. That's good – the way I look at it, everybody in the world needs to vent his spleen once in awhile. I invite any of you folks who have heartburn over the content (or lack thereof) of my masterpieces to provide a little counterforce. I guess that there's more than one way to skin a cat. Of course I know that I'm right and that anyone who disagrees with me will end up in my pipper. Who ever heard of a fighter pilot who is wrong?*

Today, I want to talk about fighter instructors. I recently took a trip to a few TAC bases. I was amazed at the attitude of some of the RTU IPs that I talked to. There was a strong undercurrent of hostility hanging in the air toward the instructor job. A lot of guys were just *positive* that the US Air Force was wasting their fighter pilot talents in a useless assignment. The MPC type that I was traveling with said that he has a heck of a time giving away instructor assignments to the RTUs. Apparently *nobody* wants to do it. Well, I have a few words to say about that.

You know, if there's one thing that is a bottom line in the IP business, it is that you, the instructor, are the most important person in the whole airplane driving world. Make no mistake about it. *You* are the guy with the most influence, the most impact, and the most responsibility. *You* are capable of singlehandedly shaping the attitudes and flying skills of the young and impressionable butter bars with whom you fly. *You* are the first example setters, leaders, teachers. *You* are guys who are tasked to make hard decisions about whether Harvey Knucklefutz belongs in the cockpit of a fighter. You're it – the single most important man in the fighter pilot's budding career.

OK, OK, it's an important job, but it's booooooooring. Right? Well, almost. The repetition, the fact that the flying is well below your capabilities, the idea that you have to watch the same mistakes over and over again – that's boring. It sure isn't boring the very first time that some ham fist tries to kill you. It sure isn't boring when you turn some empty headed, utterly dependent butter bar into some semblance of a fighter pilot. It sure isn't boring when your student walks up to you at the completion of his training and says, "Thanks, I really learned a lot about being a fighter pilot from you." What I'm trying to say is – yeah, it can be boring, but every day in the life of an RTU instructor carries a potential to really do somethig worthwhile.

If it's such a wonderful job, then why do so many RTU IPs bad mouth it? I have a theory on that, too. The fact is, there comes a point in an IP's career where he just gets "burnt out." The repetition, the lack of

nstruction

iency that is endemic in the IP
ess begins to play on the nerves
vershadows the good parts of the
.et me tell you a little story
how that happened to me.
en I was a new IP in RTU, I
a couple of solemn vows. One
se vows was that I would never
at a student (having been the
of an insufferable screamer in
the memory stuck with me).
to make a long story short, one
was sitting in the back seat
air combat maneuvers (ACM)
some guy who was about as
at air-to-air as I am ballet
ng. This guy was floundering all
he sky and refused to point his
n the general direction of the
uy. Without even realizing it, I
itting in that back seat just
ning bloody murder at this poor
cter. When we got on the
d, I was amazed that the voice
g out of the tape really
ged to me. I made another
n vow that very day — it was
for me to get out of the RTU
ess. The great revelation
red after about 2½ years as an

oking back on that tour as an IP,
e no regrets. I learned a heck of
about airplane flying and how to
with people. I think that I added
hing positive to the careers of
al aspiring fighter jocks. I was
ate to be able to leave the
ess shortly after my "burnout."
ort, I think that the RTU IP job
excellent place for a junior
captain on flying status — but, pleeeeese MPC, don't make me do it again!

OK, now that I've convinced all you guys to run out and change your dream sheet, what are some of the wonderful lessons that I learned about IPing that are worth passing on to the world? The following thoughts are lessons that I learned during my IP career that weren't immediately apparent as I began my tour.

LEADING Some time back, I wrote down a few of my thoughts on flight leaders (*Aerospace Safety*, August 1979). I found that the main thoughts outlined in that article apply in spades to the instructor. There is nothing more disgusting than to watch some turkey who doesn't have his act together try to lead a group of newbies around the sky. One rotten apple in the barrel of IPs is enough to cast doubt in the students' minds about the credibility of the entire fighter organization. A new guy quite naturally turns off a troop who doesn't know how to lead. Believe me, it is darn tough to undo the damage done by one of those guys. The problem is, as you get more and more comfortable with the RTU routine, you tend to prepare less and less for each mission. Without realizing it, the IP can slip into a rut where he forgets how to effectively lead a flight. He becomes less proficient in the airplane and less tuned in to the needs of his students. He basically turns himslf into one of those "rotten apples." I've personally witnessed, for example, IPs at the front end of a flight who are unable to control four guys on a basic range mission. A good IP has to consciously fight any tendency to slack off on flight lead responsibilities.

Our job is to produce fighter pilots, not nickelodeons.

COMPLACENCY We've all read about 6 million words on complacency. If there's one place in the world where that little gremlin will rear up and bite you on the butt, RTU is it. Every IP has his own complacency stories; here's one of mine. One day, I was sitting in the back seat on a transition mission. My stud was a good stick — he'd done super on the first two sorties. I was semi-relaxed, hands on the rail, watching Captain Kangaroo on the tube while this fine young jock was performing a simulated single engine approach. I was suddenly jarred into instant wakefulness by a variety of screams, tones, and a sudden sinking feeling. No biggee, says I, and grabbed hold of the stick while calmly telling my stud to "gimmee burner" (the F-4 burner cannot be selected from the back). You guessed it — one each Air Force issue lieutenant in the front chair was too panicked to perform that little chore. After a somewhat tenuous level off at about 6 inches off the deck, I emerged from the cloud of dust with a slightly

different outlook. One more thought about complacency: most of you people have probably heard the old saw about the most dangerous airplanes in the sky being a flight of two IPs on a cross-country. Well, I'm here to tell you, the old saw is true. I have a story about that, but I'm too embarrassed to tell it in public.

INSTRUCTION I guess there are about ninety-eleven different philosophies on the best ways to instruct somebody. I think, though, that there are a few universal truths which should not be ignored. One of those truths is that everybody is different. Obvious, right? Well, it really isn't so obvious when a guy first becomes an instructor. In every RTU, there are about three jillion written words which describe in exhaustive detail exactly how each little maneuver is to be flown. There are about 450 stan/eval toads who try to standardize everything from traffic patterns to the squadron snack bar; there is a syllabus of instruction that dictates which things get done when. What a zoo!! Nowhere is there a nice little piece of prose which states that different people need different approaches to training. If you are one of these guys who revel in standardizing your mind and body and use that same approach to each student, then you aren't going to be very effective. As a teacher and leader, it is incumbent upon you to recognize that different folks respond to different strokes.

Let me digress a little and tell a story about that. I once was associated with a student who was definitely a one-of-a-kind operation. The guy carried a log around on his shoulder – it didn't seem to faze him that all of us IPs were doing our best to push the right button. We were all concerned because we recognized that he really had the potential to become a great fighter pilot (he was self-

For 11 BFM engagements in a row he started out at my 6 o'clock and ended up in my pipper.

I think, though, that there are a few universal truths which should not be ignore One of these truths is that everybody is different. . . .

As a teacher and a leader, i is incumbent upon you to recognize that different folk respond to different strokes.

confident to a fault, aggressive hell, and never let an opportunit to give somebody a ration). An one day I flew with him. I figu that there was only one way to him. So, I took him out and proceeded to modify his ego (ir vernacular, rubbed his little tu-t the dirt). For 11 BFM engageme a row he started out at my 6 o'c and ended up in my pipper. It v wonderful thing. When we got this kid was worn out, humble ready to learn. He needed that.

Another universal truth that es a lot of IPs is the fact that you teaching a pilot to *fly his own airplane*. Doggone, you just can turn a guy into a thinking, breat *responsible* fighter pilot unless give him an opportunity to mak decisions and suffer the attendar mistakes that go with poor decis I think that too many guys sit in back seat (or the other airplane) yap, yap, yap like a magpie; they won't let up long enough to let guy think for himself. These san people sit in flight briefings and 20 questions. They turn the stud a walking regulation jukebox – in a nickel and out pops a regula This in itself wouldn't be so bad they actively encouraged discuss of basic airmanship principles, b somehow it seems that there just time. So, what to do?

The solution is simple – at all levels of supervision, especially a IP level, we are shooting ourselv right in the big toe if we don't k our basic objective in sight. *Our*

ne, you just can't turn
into a thinking, breathing,
isible fighter pilot unless
ve him an opportunity to
decisions and suffer the
ant mistakes that go
oor decisions.

roduce fighter pilots, not
oeons. We need to concentrate
lk of our efforts on stuff like:
happens when the airplane
s? Why is radio discipline
tant? How does the airplane feel
it's max performing? Etc, etc.
fortunate that some RTU IPs
have to live with the guys they
out the door. If they did, maybe
pay a little more attention to
airmanship.
last thought on instructional
que. You know, I perceive that
last few years we have
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in the fighter business. I've
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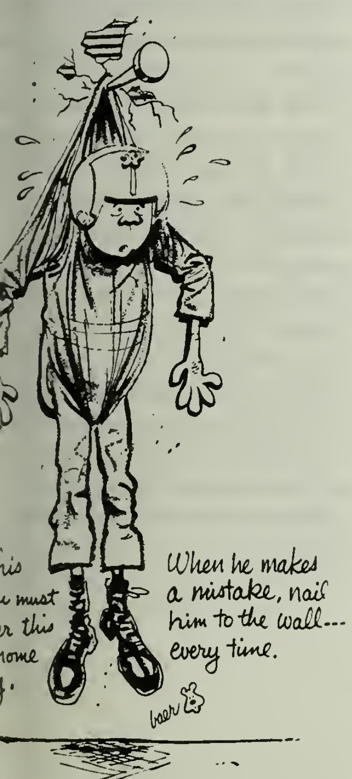
istake by one of their students.
know Harv, I really hate to



You know, I perceive that in the last few years we have somehow grown a generation of nice guys in the fighter business.

bring this up, but do you remember the time that you mistook me for the dart . . ." Time was that when some character screwed up, he knew it. I think that there are too many people around who are trying too hard to fulfill their student's psychosocial needs and not enough time solving the basic problem. We have got to recognize that the cornerstone of good fighter aviation is discipline. One of the first lessons that an aspiring fighter pilot must learn is that the difference between life and death in our business is the personal discipline that he possesses. He must learn early to take his lumps and to recognize that the lumps are for his own good. I don't think that the average newbie understands that; he doesn't recognize that the most trivial little mistake can be magnified into dead buddies in a combat situation. As his IP, you must hammer this point home early. When he makes a mistake, nail him to the wall — every time.

One of the first lessons that an aspiring fighter pilot must learn is that the difference between life and death in our business is the personal discipline that he possesses.

Now that I have made three main points, I will sign off with a true story that I think perfectly illustrates what happens when a bunch of instructors don't do their job right (unfortunately, examples of IP success are usually taken for granted): there was once a young nugget who went on an ACM ride. He was educated exactly as the syllabus dictated — he had been standardized, questioned, checked, and his head was full of facts. During that ACM ride, he somehow got himself into a negative G situation. He perceived that he was out of control as his IPs had told him, "If the airplane doesn't do what you want it to do, it is out of control." Now this nugget sure as hell didn't want to have neggies on his grecian body, so he went through the out-of-control procedure, which consisted of pushing forward on the stick. After a few thousand feet worth of red eyes, he and his airplane decided that they didn't like each other anymore and they parted company. The airplane clobbered the ground in controlled flight sans pilot. How 'bout them apples?

Do you think that that kid was at fault? I don't. ■

DEFENSIVE FLYING

By CAPTAIN DENNIS STORCK
Directorate of Aerospace Safety

■ A few years ago, a nationwide education campaign known as "defensive driving" was initiated to decrease the number of motor vehicle accidents on our nation's highways. Airplane drivers, believe it or not, we have a similar program. It's called "see and avoid." Judging from 1979 statistics on near midair collisions (NMACs), see and avoid definitely needs more publicity and attention in our effort to reduce those close encounters. This article will present the 1979 NMAC statistics, focus on the hot spots to be particularly aware of, and show you why Air Traffic Control (ATC) can't always bail you out of those situations, (i.e., known but unavoidable system limitations).

The results from 1979 are in and they bear serious consideration. Reported NMACs in 1979 occurred below 12,500 feet. Sounds like the altitudes where general aviation aircraft fly? Right!!! Furthermore, a whopping 54 percent occurred below 3,000 feet above the ground (AGL). Now, that's getting a little too close to the cumulogranite for comfort. We can even narrow this down further, and see that 64 percent took place in airport traffic areas and along designated departure and arrival routes. The remaining NMACs reported occurred along military training routes, in military operating areas, restricted areas, or in other enroute airspace.

But, why should we worry? We military pilots fly primarily on an Instrument Flight Rules (IFR) clearance. Thus, ATC knows exactly where we are and where we plan to go. They'll call out all the bogies to us. Right? Well, let's take a closer look at that one. Actually, you're only partially correct. An IFR clearance does not put a magic bubble around you and your aircraft, keepin both eternally safe. All the IFR clearance does is ensure positive separation from other aircraft known to ATC.

The key word of course is *known*. This suggests that when ATC gives traffic advisory, it will be given in time for the aircrew to take the necessary evasive action. This assumption is not necessarily true. I fact, in only 24 percent of the incidents reported were traffic advisories given in time to be useful. In many cases this occurred because ATC radar has some limitations that can create a large discrepancy between aircraft "known" to ATC and the actual number out there flying.

example, the tracking of ft at low altitutes is extremely ult and the probability of the n seeing every aircraft is licated by several factors — the place where all the action is, ding to our statistics. Ground r can block out returns from aircraft, making it difficult to who's who. Furthermore, many al aviation aircraft have no ponder, making identification to impossible. Others, while pped with a transponder, have no ding altimeter and associated de readout. Thus, after the ion of the target is identified, you have no information as to her it is high, low, or at the same de as you. This problem will more complex as the number of le experiencing the freedom of ral aviation flying grows. And, is precisely what has been ening in recent years.

avigation facilities/aids can also factor. Line of sight problems ciated with VOR/TACAN radials cause aircraft flying at low ides and using these navigation to get off course unless accurate references are available and . Navigation facilities also ribute to the potential for NMACs heir location. When located cent to military airports and/or ic patterns, the potential exists for ncreased volume (or congestion) affic created by aircraft using e aids for navigation. Also, airports make excellent visual, landmarks.

As do highways — but they also pose a hazard when located near an air base. Many VFR pilots navigate by highway which can put them near or even within the base traffic pattern. For example, a recent Hazardous Air Traffic Report (HATR) concerned a civil aircraft flying along a highway which was very near and parallel to the final approach course at an Air Force base. The USAF pilot on final found the near encounter rather sporty. Fortunately, some alert controllers averted what could have been a more serious matter.

The proximity of nonmilitary airports to your origin/enroute/destination military airport should also be a consideration. Because the majority of general aviation aircraft operate under visual flight rules (VFR), ATC has neither knowledge nor control of when those aircraft will depart or where they will be going. Their flight paths are virtually unpredictable.

Finally, you should consider the weather (specifically ceiling and visibility) at your landing base, to help you determine where to be especially watchful for other aircraft. As both a military and general aviation pilot, I always thought the one time I didn't have to be concerned about those bug smashers was when the weather was delta sierra. Who, in their right mind, would be out there in marginal conditions, flying a single engine aircraft, whose performance is significantly affected by weather? Well, I soon found my opinion didn't represent the status quo. Those who do opt for this sporty adventure fly lower, just beneath the clouds. Prescribed cloud clearances are, therefore, not always adhered to. Thus, just when you've worked your tail off maintaining course, glidepath, airspeed, configuration, etc., and prepare to break out of the clouds, ZAPPO, you see someone tooling along traversing your flight path just beneath the clouds.

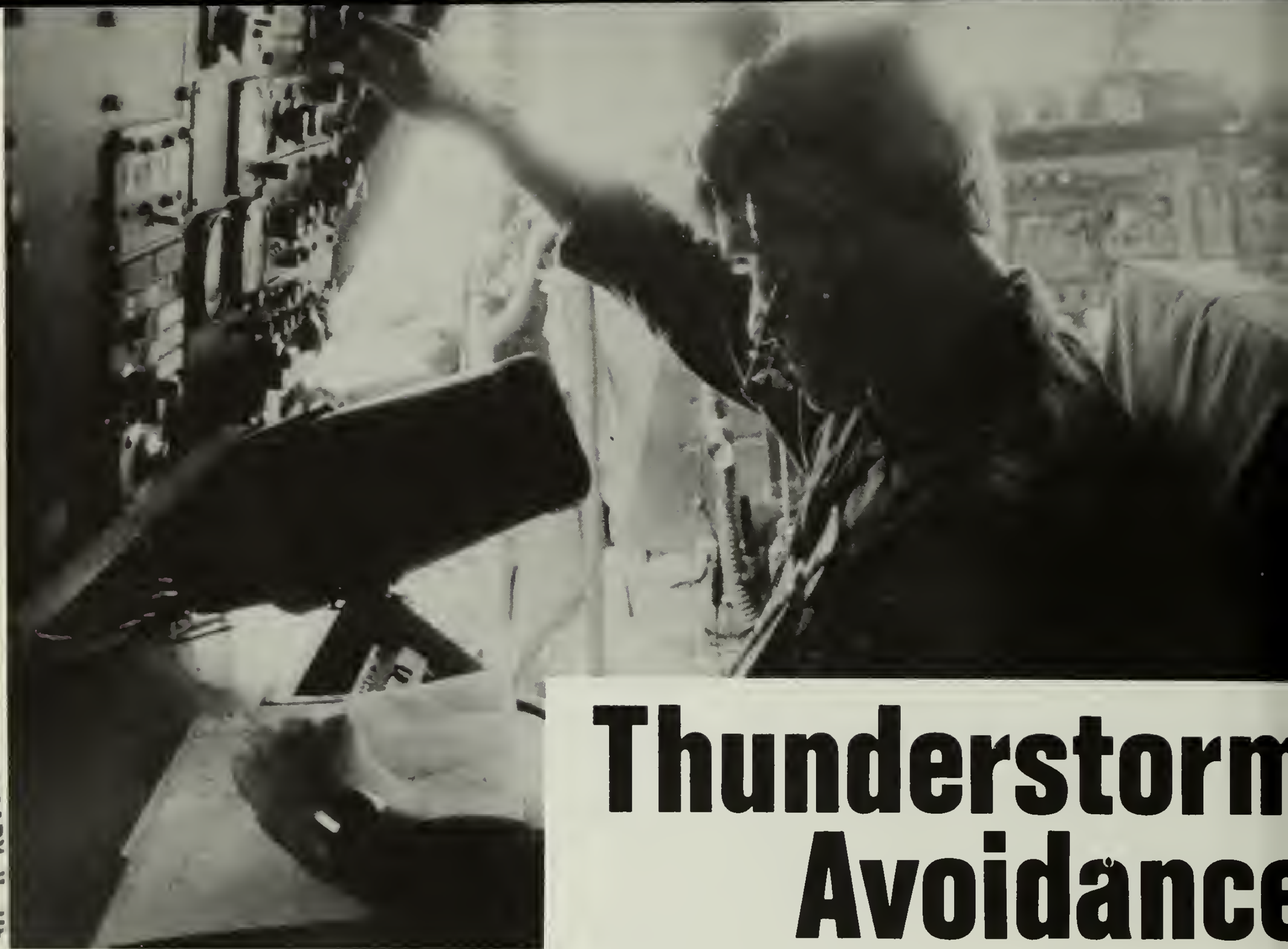
Many VFR pilots navigate by highway which can put them near or even within the base traffic pattern.

Remember, a good many general aviation pilots do not possess an instrument rating. They follow roads, railroads, power lines, etc. If the weather blocks their view of these "IFR" references. they'll descend as low as they can to be able to navigate. Hence, the potential for collision.

Are you beginning to get the feeling that if you don't look out for yourself, no one else will? Well, that should be sufficient motivation. I know that in most cases we're bigger than they are and, therefore, they should see us long before we see them. But often they don't.

And when they don't is usually at low altitude when we have the most tasks to accomplish (i.e., checklists, radio and altitude calls, instrument crosschecks, coping with windshear, weather phenomena, and perception difficulties). All these tasks are essential and we obviously cannot eliminate any of them, in lieu of another. We must, instead, include one more demand in an already demanding job, watching out for the other guy.

The central theme of all those NMACs statistics is that the closer you get to the ground the more attention you need to devote to "defensive flying." We all fly through congested areas and altitudes at one time or another and each flight crew knows approximately how much time will be spent there. Therefore, you should judiciously allocate when and where you should be looking outside. I know this is going to make the mission planning session last a little longer, but it could save your life. ■



Thunderstorm Avoidance Using Airborne Radar

By CAPTAIN ROBERT E. LEBLANC
Chanute AFB, IL

■ When you picked up this magazine and thumbed through the index and saw this article on thunderstorms, you probably thought: "What is all the fuss about thunderstorms, anyway? I have flown around and through thunderstorms without so much as a bump."

Many pilots become complacent about thunderstorms because they have made successful penetrations. As you all know, in the flying business, complacency can kill. The purpose of this article is to review basic principles of operating airborne radar for weather avoidance and scope interpretation.

The best advice I could offer about flying near and through thunderstorms is don't. But, you and I know this is not practical because of mission requirements. Since you must fly to accomplish your mission, let's zero in on what precautions and actions you can take to increase your chances of successfully negotiating thunderstorms. You spend time studying and practicing dash one procedures, instrument approaches and ATC procedures. When was the last time you took a look at AFM 51-12, *Weather for Aircrews*? A professional pilot must have a knowledge of weather, especially its effect on aircraft operations.

Successful encounters with thunderstorms begin with a thorough knowledge and understanding of thunderstorm characteristics and structure. There are many sources of information on this subject. Chapter 11, AFM 51-12 is a good place to start. Aircraft with airborne radar have an advantage when it comes to avoiding thunderstorms. Radar allows you t[o cir]cumnavigate potentially dang[erous] cells. However, it does not guar[antee] success. It may keep you out [of the] strongest cell, but the innocent lo[oking] cell you decide to penetrate may [pack] a punch that exceeds the stru[ctural] limits of your aircraft. Any [thun]derstorm is potentially dange[rous.] Successful penetration of t[hun]derstorms with airborne radar de[pends] on three factors: radar set calibr[ation,] your knowledge of radar princ[iples] and your skill in interpreting the scope.

The first factor, radar set calibra-on, is beyond your control except iat you write up malfunctions in the ircraft forms. If the set is not calib-ited, you will not be able to compare idar returns from one day to the next. cope interpretation is a very subjec-ve process. Without an accurate ref-rence level, your previous experi-nce will be of little use in your deci-ion of which cell to penetrate.

The following radar principles apply) all airborne radars. Your particular et may be more sophisticated, but ime and space do not permit detailed xamination of specific radars. Let's egin by examining beam width.

BEAM WIDTH The radar beam used n most airborne radar is a narrow 3° encil beam that is able to define the ize and shape of thunderstorm cells. The size of the radar beam cross-ection increases significantly at increased ranges. Figure 1 illustrates the width of a 3° beam at 30, 80 and 180 nautical miles.

Beam characteristics account for the phenomena of splitting cells. As you approach an area of thunderstorms, a cell may appear to split and form two separate cells. Although splitting may occur occasionally, in the majority of cases this is only an illusion caused by the finite width of the beam. For example, the beam width at 180NM is approximately 10 nautical miles wide. If there are two cells, eight miles apart, they will appear as one cell. As you get closer, they appear to split when the beam width becomes less than eight miles. If there is any precipitation within the beam, it will be displayed as if the entire beam were "filled" with precipitation targets. The target displayed on the scope will not appear to become weaker prior to splitting into two targets.

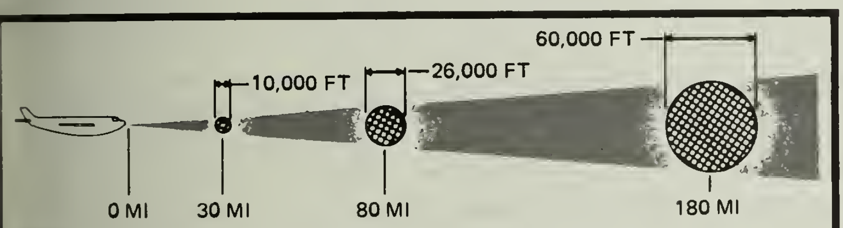


Figure 1. Radar beam cross-section illustrating width at 30, 80, and 180 nautical miles.

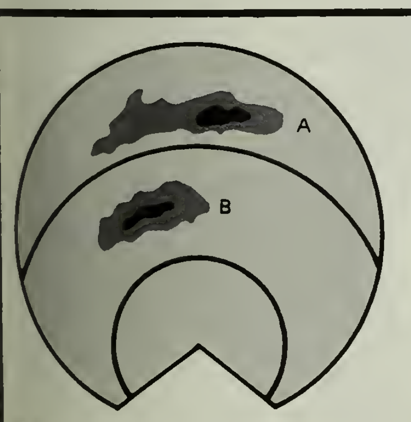


Figure 2. Effects of attenuation caused by other thunderstorms.

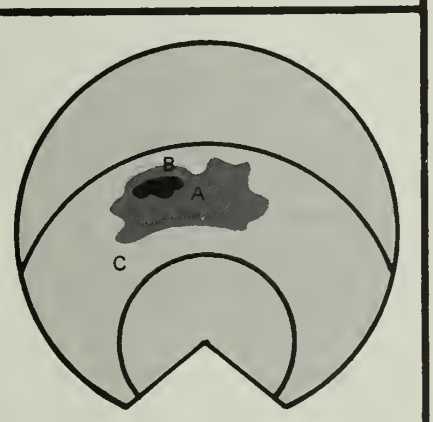


Figure 3. Contouring pattern illustrating precipitation.

ATTENUATION Attenuation is a reduction of the energy in a radar beam due to absorption in the atmosphere. Of particular importance to the pilot is the attenuation caused by precipitation. The intensity of strong cells can be masked by other cells that lie between your aircraft and the strong cell. Figure 2 illustrates the effects of attenuation. The left side of cell A appears to have a weak return. This is caused by attenuation by cell B. The left side of a cell may be more intense than the right side. Be suspicious of weak returns located behind other cells.

RANGE EFFECTS The power of the reflected energy received back at the radar set is inversely proportional to the square of the range. For example, if you observe two cells of equal intensity, one at a range of 10 miles and the other at 20 miles, the cell at 10 miles will appear four times stronger. This is why cells sometimes appear to become stronger as you get closer to them. Many radar sets use a Sensitivity Time Control (STC) to reduce the problem caused by range effects. All echoes of the same intensity displayed within the STC range will have the same intensity displayed on the scope. Know your set.

GAIN AND INTENSITY Gain and intensity controls can be very helpful if used correctly. The gain and intensity controls are usually set at a standard setting. If, for some reason, you must penetrate an area of strong cells, reducing the gain and intensity will have the effect of eliminating all but the most intense thunderstorms. On the other hand, if you wanted to avoid all areas of precipitation, increasing the gain and intensity will enable you to paint weaker returns.

CONTOURING Contouring is the ability of the radar set to blank out signals above a preset value. The most intense part of the cell can be blanked out al- ☞

Thunderstorm Avoidance continued

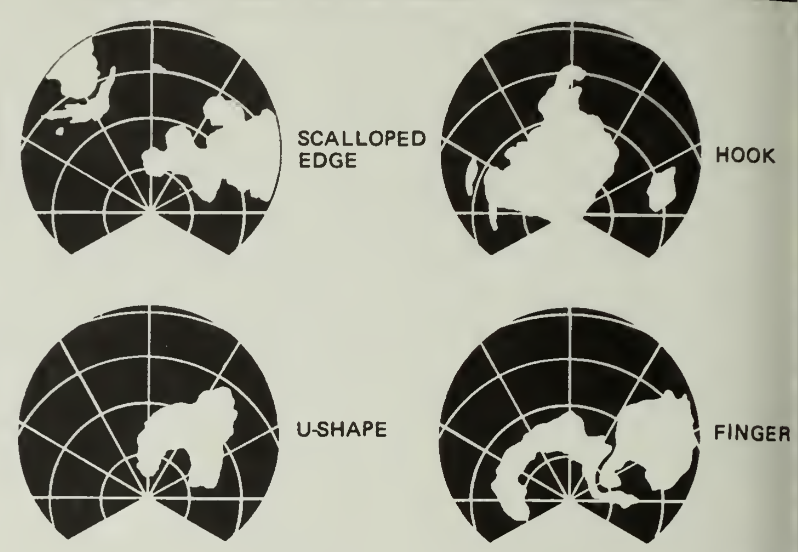


Figure 4. Radar echoes of severe thunderstorms.

lowing easier identification of potentially turbulent areas. This feature is of limited value since it does not provide a quantitative measurement of intensity. However, contouring does show the gradient of precipitation intensity. Figure 3 is an example of contouring. A gradient is the change of a property over a specific distance. The gradient between A and B is much greater than the gradient between A and C. A tight gradient usually indicates an area of turbulence, because it is an area of weak vertical motion adjacent to an area of strong vertical motion resulting in wind shear. Caution is in order when the tight gradient is on the back side of a cell. The gradient may be the result of heavy attenuation.

TILT CONTROL The radar antenna should always be used to vertically scan thunderstorms. Thunderstorm intensity varies significantly throughout the vertical extent of the cell. The strongest updrafts occur in the mid-levels, between 18,000 and 30,000 feet. Changing the antenna tilt will ensure that potentially hazardous areas will not go undetected.

Radar returns of precipitation areas indicate the intensity of precipitation, not the severity of turbulence. Radar measures the reflectivity of the precipitation. Large drops reflect more energy than smaller drops. Hail, which is covered with a thin layer of water, reflects still more energy. Large water droplets and hail exist in strong updrafts. It is in these updrafts where turbulence is located. Therefore, we can generalize that areas of strong radar returns are indicative of turbulence. There is no rule of thumb that correlates the strength of the return with the severity of the turbulence. Beware! One day you may penetrate a strong return and not feel a thing; the next penetration of a weak area may result in a turbulent encounter.

The best way to avoid severe weather associated with thunderstorms is to effectively use airborne radar. Your ability to successfully circumnavigate potentially dangerous thunderstorms depends on your scope interpretation skills. Scope interpretation is extremely subjective. Improving your skill requires a detailed knowledge of thunderstorm structure and the capabilities of your radar.

Experience has shown that there is a good correlation between certain radar echoes and hail, severe turbulence and tornados. Figure 4 illustrates these echoes: scalloped-edge, hook, U-shapes and fingers. Cells exhibiting these signatures should be avoided. A scalloped-edge echo is a good indication of a rapidly changing and potentially severe thunderstorm. Finger shaped appendages are good indicators of hail. The hook-shaped echo is an indication of a possible tornado. Most tornados occur below 5,000 feet, so you must tilt your antenna down to detect a hook echo if you are above 5,000 feet. The cyclonic circulation associated with a tornado extends throughout the thunderstorm. Av cells with hook echoes — they dangerous.

Avoid all severe cells by at l 20NM. Outside the cloud, shear tu lence has been encountered sev thousand feet above and 20 miles erally from a severe storm.

Airborne radar is a definite a when circumnavigating th derstorms, but do not be lulled in sense of false security because have airborne radar. Any thunderst packs enough energy to destroy aircraft if you fly into the right are the right time. Airborne radar he but it is not a substitute for tempe judgment. Be prepared! Review ch ters 11 and 18, AFM 51-12, for capabilities of your airborne radar thunderstorm penetration pro dures. ■

About The Author

Captain Lablanc anlisted in tha Air Forca in 1961 worked as an aircraft machanic until accapted into Airman Education and Commissioning Program. In ha graduated from tha University of Utah with a B Mataorology and racalved a commission through Of Training School. Ha racaivad a MS in Meteorolog 1974 from tha University of Wisconsin. Ha sarved waathar foracastar at McCoy AFB, Florida and Kad AB, Japan. Ha Is marriad and has thraa chiidran. Cap Lablanc is presantly a coursa suparvisor in tha Wea Training Branch at Chanuta AFB, Illinois.

OPS topics

...cured For Takeoff?

A pilot was on a solo ...ctional check flight mis...n in a T-38. The FCF ...nt along smoothly until he ...empted to fly inverted. At ...nus three-fourths "G" ...d 300 knots, he heard a ...mp. He rolled upright and ...nd that control stick mo...n was severely limited to ... left and aft. A controlla...ity check showed that 210 ...ots with gear down and ...ps up was the minimum ...ntrollable landing speed. ... landed at 210 knots, los...g only some tread from the ...se gear tire.

A look at the aft cockpit ...vealed an upsidedown sur...val kit wedged against the ...ntrol stick. It apparently ...d not been properly sec...ed prior to takeoff.

This incident fortunately ...ded uneventfully, but it ...uld have had disastrous ...sults. Don't you agree?— ...r. Rudolph C. Delgado, ...irectorate of Aerospace ...fety.

For Aero Clubbers

An airman flying an aero club C-150 reported the engine started losing power which finally led to a crash landing in rough mountain terrain. Why the engine lost power could not be determined, but a possibility could be carburetor icing. In any event, the pilot and passenger were lucky—they were uninjured, although the aircraft was totaled. The lesson from this episode is that flight over mountains or any rough terrain should be at an altitude that will permit maneuvering to a suitable landing site. The C-150 was being flown at 500 feet and when the engine gave out, there wasn't time to do much maneuvering. Remember the old saying about the "runway behind and altitude above."

Advice From an Engine

There's a saying just now being coined: "If you take anything for granted, it might take you." How true in the following scenario.

Crew chief finished preflighting an F-4, goes to lunch, leaving his mike cord in the right intake.

Ops and maintenance control agree to an early launch.

Two other crew chiefs sent to fill in and expedite the launch.

The A/C saw the cord but assumed the crew chief would remove it to launch the aircraft.

Substitute crew chiefs did not see the cord.

Engine start: engine sucks up cord. Sparks and fire from tailpipe.

Engine very sick.

Engine offers advice: don't assume, don't take anything for granted, or you too may spit sparks.

Airplanes
by Eric Johnson

Did you know there are four forces of flight. They are Lift, Drag, Trust and Gravity.

Lift is like if you let a piece of paper and a paper ball fall down because air slows down the paper because the spread out wings make it go slower before it hits the ground. Drag is partly like lift because the front part of the wing is tilted up and if tilt up too much the plane goes backwards. Gravity makes the plane go down. Trust makes it go forward.

We thank Eric for his contribution, which may be of more general application than he thinks. As a matter of fact, Trust makes most things go forward.—From NASA's *ASRS Callback*. ■

SAFETY TROPHIES for distinguished contributions during 1979

CHIEF OF STAFF

INDIVIDUAL SAFETY AWARD

Presented to Air Force personnel who made significant contributions to safety during 1979.

COLONEL ROBERT R. SAWHILL, JR.
Chief of Safety, National Guard Bureau

Colonel Sawhill managed the ANG safety program during a period of change marked by integration into the total force concept and increased responsibility and modernization. His safety program leadership for 91 flying units at 86 locations produced an all-time low in Class A flight mishaps.

CAPTAIN JONNY J. HEPLER
51st Composite Wing (Tactical), PACAF

As Chief, Weapons Safety Branch, Captain Hepler's efforts resulted in a reduction in explosives quantity distance waivers while freeing needed land for other essential facilities. This produced safer working conditions and enhanced operational efficiency.

CAPTAIN GEORGE M. WOLFE
388th Tactical Fighter Wing, Hill AFB, Utah

As flying safety officer for the 4th Tactical Fighter Squadron, his innovative trend analysis program and knowledge of aircraft systems led to significant cost savings and improvements in maintenance procedures. Through his efforts, deficiencies in boundary layer control, brakes, nose wheel steering and engine components were identified and corrected which provided a safer flying environment.

STAFF SERGEANT LARRY W. KERR
554th Civil Engineering Squadron, PACAF

As squadron safety technician, his initiative and professionalism produced outstanding safety support for a program involving $11 million, 750,000 military and 2,000 DAP civilian manhours, 275,000 local national manhours and 170,000 miles of general vehicle operations.

THE KOREN KOLLIGIAN, JR. TROPHY

Awarded to a USAF aircrew member for coping with a serious inflight emergency. Major Peters' handling of a serious aircraft emergency in an SR-71A, during which one engine had to be shut down while the other exhibited erratic performance and reduced thrust, resulted in a successful landing and saved the Air Force a valuable reconnaissance aircraft.

MAJOR DAVID M. PETERS
9th Strategic Reconnaissance Wing
Beale AFB, CA (SAC)

THE COLOMBIAN TROPHY

Symbolic of excellence in military aviation safety, The Colombian Trophy for 1979 was awarded to the 18th TFW. The wing flew more than 23,000 mishap-free hours in seven different types/models of aircraft while converting to the F-15. This achievement occurred while the wing flew a high risk, complex mission and participated in numerous exercises and deployments.

18TH TACTICAL FIGHTER WING (PACAF)

THE SICOFAA AWARD

Awarded by the System of Cooperation Among Air Forces of the Americas for excellence in aircraft accident prevention. For its significant accomplishments of flying 17,508 hours without a Class A or B mishap, while accomplishing a most demanding mission in a high threat environment, the 347th was selected winner of The SICOFAA Trophy.

347TH TACTICAL FIGHTER WING
Moody AFB, GA (TAC)

Excellence In Safety

Annually the Air Force recognizes a number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all those nominated can win awards, although their excellent performance earned them a nomination. Heretofore, only the winners of the safety awards received recognition. We think, however, that nomination for an award indicates demonstration of excellence and that, even though a nominee did not win the big one, some recognition order.

Space does not permit a narrative description of the complishments of the individuals, units and comm listed (however, the nominees for the Kolligian A were all Well Done winners and their stories have told in these pages); herewith then, a listing of t nominated for top performance in safety in 1979.

CHIEF OF STAFF INDIVIDUAL SAFETY AWARD

Ssgt William L. Paskiet, Ground Safety Technician, 314th Tactical Airlift Wing (MAC), Little Rock AFB, AR.

Capt Charles M. Westenhoff, Squadron Flying Safety Officer, 1866th Facility Checking Squadron (AFCC), Rhein-Main AB, Germany.

Maj Kenneth S. Harvell, B-52 Flight Commander, 7th Bombardment Wing (SAC), Carswell AFB, TX.

MSgt Anthony E. Baur, Ground Safety Superintendent (ACC), Elmendorf, AFB, AK.

Capt James S. Shaddock, Flight Safety Officer, 5010th Combat Support Group (AAC), Eielson AFB, AK.

TSgt James O. Cheek, Ground Safety Technician, 5010th Combat Support Group (AAC), Eielson AFB, AK.

SSgt Steven W. Ulrick, NCOIC Ground Safety, 1974th Communications Goup (AFCC), Scott AFB, IL.

Maj David M. Mills, III, Chief of Safety 452d Air Refueling Wing (AFRES), March AFB, CA.

Mr. Theodore Zoska, Jr., Safety Specialist, 14th Flying Training Wing (ATC), Columbus AFB, MS.

Capt James S. Davis, Squadron Flight Safety Officer, 80th Flying Training Wing (ATC), Sheppard AFB, TX.

Mr. Kenneth L. Groves, Chief, Ground Safety, 1606th Air Base Wing (MAC), Kirtland AFB, NM.

TSgt Russell A. Glen, NCOIC Missile Safety, 321st Strategic Missile Wing (SAC), Grand Forks AFB, ND.

Mr. Richard C. Robeen, Ground Safety Officer, 1st Special Operations Group (TAC), Hurlburt Field, FL.

KOREN KOLLIGIAN, JR. TROPHY

Maj Robert G. Little, Jr., 48th Tactical Fighter Wing (USAFE), RAF Lakenheath, UK.

Capt William T. Malarkey, 48th Tactical Fighter Wing (USAFE), RAF Lakenheath, UK

Capt Eric M. Coloney, 50th Tactical Fighter Wing (USAFE), Hahn AB, GE.

Maj Richard H. White 3d Tactical Fighter Wing (PACAF), Clark AB, PI.

Capt Richard L. Cline, 3d Tactical Fighter Wing (PACAF), Clark AB, PI.

Capt Michael W. Lichty, 31st Tactical Fighter Wing (TAC), Homestead AFB, FL.

Maj Jerome C. Hauck, 602d Tactical Air Control Wing (TAC), Bergstrom AFB, TX.

Maj Michael E. Brinkley, 314th Tactical Airlift Wing (MAC(, Little Rock AFB, AR.

Capt Robert E. Colley, 349th Military Airlift Wing (Associate) (MAC), Travis AFB, CA.

COLOMBIAN TROPHY

347th Tactical Fighter Wing (T Moody AFB, GA.

28th Bombardment Wing (S Ellsworth AFB, SD.

The 463d Tactical Airlift W (MAC), Dyess AFB, TX.

86th Tactical Fighter W (USAFE), Ramstein AB, GE.

917th Tactical Fighter G (AFRES), Barksdale AFB, LA.

109th Tactical Airlift Group (A Schenectady County Airport, York.

SICOFAA FLIGHT SAFETY AWARD

928th Tactical Airlift G (AFRES), Chicago, O'Hare In tional Airport, IL.

436th Military Arlift Wing (M Dover AFB, DE.

463d Tactical Airlift Wing (M Dyess AFB, TX.

18th Tactical Fighter (PACAF), Kadena AB, JA.

3d Tactical Fighter Wing (PA Clark AB, PI.

28th Bombardment Wing (S Ellsworth AFB, SD.

6th Strategic Wing (SAC), E AFB, AK.

479th Tactical Training (TAC), Holloman AFB, NM.

The best pilot
n the squadron

MAJOR MICHAEL T. FAGAN
ectorate of Aerospace Safety

Not long ago, as an unproductive ppy hour wound to a close, several my flying colleagues and I were hered around the dregs of the last cher, which was rapidly proaching being too flat to drink. is often the case when aircrew mbers "stand to their glasses," the nversation drifted from war stories through "where is ol' so-n-so," to memories of those no longer with us.

Some had been recruited by the airlines and some had gone to rated sup, but the talk centered on one of our number who had met an untimely end on a desert gunnery range. If there is a special eulogy for pilots, it is not delivered by a chaplain from a pulpit – it is spoken by his mess-mates in the bar as the happy hour crowd thins out and the beer gets warm. No congregation could be more sad-faced. No higher praise could be given. The ceremony is as predictable as any formal funeral. Sometimes there are even hymns of a sort, and green Nomex is a kind of vestment. It was an unfortunately familiar scene to most of us who had been around for a few years. Inevitably, someone said, "Yeah, he was the best pilot in the squadron." All who knew him nodded their heads in silent accord.

He certainly had been a memorable figure. He had been assigned to standboard as a lieutenant. An

☞

The best pilot in the squadron continued

academy graduate, his bearing and conduct were exemplary. He knew the dash-1 down to the publisher's initials and was an authority on all the "non-boldface boldface" published by the MAJCOM on down. Though he got to SEA too late for the hot part of the conflict, he extended until the very end and played a highly decorated part in the evacuations and the Mayaguez affair. He was always chosen to lead the tough missions and earned the total respect of his superiors at all levels. His exploits were legendary. He was the one who went to the development conferences and flew the test program. His physical appearance was striking, he was well ahead in his PME, he was always available when the schedule changed at the last minute, and he more than pulled his weight in the additional duty department. Besides that, he was a nice guy. No one was surprised when he was selected for major below the zone.

He was the best pilot in the squadron.

It does not pay to speak ill of the dead, but wait a minute! If he was so good, why is he dead? At the risk of asking a sacrilegious question, how about those other well-remembered colleagues who have been honored with the posthumous title of "best pilot in the squadron?" Is there something about being the best which is fatal? What good is being the best if it kills you? What good is having the best in the squadron end up in a box when he is needed in the cockpit? Let's take another look at this paragon of pilot virtues.

He was aggressive, ambitious, and confident. These are admirable qualities — — in fact, they are requirements for the job. There is, however, an important distinction between confidence and over-confidence, aggressiveness and over-aggressiveness and even achievement may be over-done, or done too fast.

He had required a little command assistance to transition into a new weapons system when he did, and no one was surprised when he got it. That he was killed on a range *was* a surprise. He had a lot of low level experience. He liked being down in the weeds, and he was good at it. The investigators found nothing wrong with the aircraft. It appears that he simply flew into the ground after pulling off the target. He either didn't hear the "knock it off" call or it came too late. In any case, he got low enough to prompt a call and apparently did not react to it prior to impact.

Could there have been a malfunction? He had previously demonstrated exceptional ability to bring the aircraft home when another pilot might have landed at an intermediate point, even though maintenance would have been inconvenient and the squadron would have bought a bunch more down time. He was good enough (and mission oriented enough) to take a bird with minor discrepancies, w around them, and get the job do He was a mission hacker. "Ya g be tough . . ." he had said more once. It probably wasn't a malfunction. He could have han any malfunction small enough to missed by the investigators.

The flight was a late afternoo launch, but there is no reason to believe that he had been fatigue was not a heavy drinking man a had had no duties which would conflicted with crew rest. Besid during the Mayaguez mission he demonstrated that he could perf when tired. He had flown sortie sortie, on his own adamant insis even though there were more re pilots available. He kept getting airplane despite fatigue. After a was the best pilot in the squadr and that was one tough mission little fatigue wouldn't have both him.

He bought the farm on a che ride, but stress couldn't have be factor — he always did well on checkrides. In fact, stress may actually have improved his

erformance. At Kho Tang Island he arned a medal for going in on the ottest objectives. In one case, he ent in a third time after being shot ff twice. Now, that's stress! No . ., he was not one to choke under essure.

In the final analysis the report oncluded that the cause of the cident was "pilot distraction" or disorientation." In other words, hat used to be called pilot error. But rors are not something one would pect from the best pilot in the quadron. On the other hand, if he d not "gotten caught," no one ould have ever suspected that he had en disoriented or distracted. He had hibited no such tendencies, or at ast none had been recognized.

But it only takes once, and it's hard make a habit out of having fatal cidents. The diagnosis has to come fore the fact in order to do any od, and it's no easy task.

The distinction between the spirit attack and dangerous lack of ution is not always readily parent. What passes for gressiveness may be found to be (or least labeled) recklessness after an cident. Spirit, however, is a erequisite, and an excess of caution is self-defeating. A force of timid pilots, relucant to take any risks, is not acceptable. Neither is a corps with the disdain for death of kamikazes (especially if training flights are required). What is required are pilots with the will to accomplish the task at hand, but the sense to recognize that a given result is not worth the loss of an aircraft and crew. This is especially true in a training environment.

During the early 70's, when Vietnamese aviation cadets were receiving primary training in the United States, one Vietnamese training officer would address each arriving class with the following safety philosophy: Each student must become the best possible pilot. That requires both nerve and skill. Since the mission doesn't end with a single sortie, a good pilot must be available to fight tomorrow. Good pilots bring both themselves and their airplanes home. Dead pilots are bad pilots. The loss of an airplane in training is as detrimental to the war effort as a direct hit from an SA-7. Sometimes it takes nerve to refuse an aircraft or abort a mission. That's part of what it takes to be a good pilot – nerve.

So what does this have to do with the pilot who is the subject of this tale? Little or nothing. Flying safety lectures will do him no good now, and apparently didn't do him enough good when he was alive. All those monthly meetings, special briefings, and bulletin boards weren't enough to keep him alive. Neither were his skilled, highly trained hands and feet, vast knowledge of regulations and procedures, or extensive experience. For all his education, ability, and desirable attributes, his final professional act was costly and wasteful. He destroyed a valuable aircraft and killed its pilot. At the very best, he did not prevent the loss, and he was the last person who could have done so.

The best pilot in the squadron? He's still in the squadron. He, too, knows the books, has the skills of a brain surgeon, and reeks of moxie, but he comes home with his airplane intact. Maybe it's that little bit of extra for Mom and the safety officer. Who knows? One thing is for certain though; the best pilot in the squadron will get the job done without unnecessary losses. While he's there to fly and fight, he knows that broken birds stay on the ground and dead pilots don't defeat anybody.

The pilot's epitaph will, unfortunately, be occasionally intoned in the bar while the ice melts and the happy hour crowd drifts out the door with the smoke. It's a traditional way to honor our dead. But in the meantime, let's be honest – here's to the real best pilot in the squadron. The one who's still with us. ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

RATED PRIORITIZATION – setting the record straight

By COLONEL HENRY VICCELLIO, JR.
Chief, Rated Officer Career Management

■ Whether you're presently serving at wing, MAJCOM, or Air Staff level, you've probably heard of rated prioritization, and even may have seen some of its early effects on your organization and its people. Being right in the middle of this initiative, and being hit with dozens of questions daily from around the Air Force, we thought a bit of the basic background and thrust of prioritization – why it's here and what it's aimed at – might clear up some of the misconceptions we know exist.

The Rated Shortfall

The principal driving factor behind prioritization is our current shortage of rated officers – we could be over 2,000 pilots and 400 navigators short of total AF requirements by the end of fiscal year (FY) 1980, with projections through 1985 looking even worse. These shortages have evolved as the result of three simultaneous factors. First, due to sizable rated officer surpluses following the Southeast Asia (SEA) conflict, we were forced to program the lowest UPT/UNT rates in 30 years – we only trained 1,047 pilots and 594 navigators in FY79. Simultaneously, we began to see a substantial decrease in both pilot and navigator retention – we lost 2,946 pilots and 1,136 navs in FY 79. The third factor was an unprogrammed increase in the rated officer requirement beginning in FY77. All of these added up to a rapid transition from overages to substantial shortages – shortages that we'll be living with for a while, despite the fact that we plan on doubling the training rate over the next four years!

Handling the Problem

Given the unavoidable fact that we're facing r
officer shortages over the next few years, the next obv
question is how to best distribute that inventory? W
can we best afford the impacts of drawing down
operating with some degree of undermanning?

Traditionally, the Rated Supplement has acted as
primary "shock absorber" for fluctuations betweer
rated officer requirement and inventory. W
requirements dropped off after the Korean conflict
example, over 18,000 rated officers were assi
"behind the lines." As the SEA conflict blossomed
number of rated officers in support duties shrank to ar
4,000, only to grow again to the 7,700 mark afte
conflict ended. As anyone who has been following
column realizes, the past three years have been marke
yet another sharp supplement drawndown, as the fa
mentioned above began to reduce our rated overag
became clear as early as two years ago, however
simply drawing down the supplement wouldn't handl
situation – things were happening so fast tha
supplement would disappear by 1981! This
unacceptable to USAF leadership and management
only does the supplement represent our surge capa
during wartime, but a high-priority need for qualified
presence at AFIT/PME and in such areas as engine
maintenance and logistics, planning and programming
at the precommissioning sources (USAFA, ROTC,
has been well established.

What was called for was a plan that balanced the
for rated officers in each part of the requirement stru
How do crew force needs stack up against manning
in the staff? How about high-visibility Joint require
in JCS and overseas? Where do AFIT and PME
These and other questions needed answering, an
answers weren't simple. Decisions from the top
needed, backed by thorough analysis and experi
judgment. To pursue the needed answers, a ser
prioritization conferences was held, involving worl

ticipants from action officer level to the Assistant Vice ief of Staff and MAJCOM Vice Commanders. The :d supplement and rated needs of each major USAF :ncy were studied in detail, with the mission and sonnel management impacts of undermanning at ious levels clearly spelled out. The plan that emerged FY80 was based on several general findings:

ı. Sufficient rated inventory will be available to man crew and instructor (CCTS) line force at full strength, iding direct readiness impacts.

›. Resultant undermanning in the rated staff (wing ɔugh Joint/Air Staff levels) will have significant impact, should not preclude basic mission accomplishment so g as identified "crunch points" can be sustained.

. Career development opportunities for rated officers l still be available, but will be somewhat reduced in pe as rated staff and supplement manning is reduced.

The supplement will face additional drawdowns in rly all career fields, but identified "bottom line" levels he key areas mentioned above and a few others will be ained.

AFIT/PME quotas will remain filled so as to provide roperly trained rated officer force for leadership/management duties throughout the requirement structure.

ased on these determinations, a detailed prioritization ı was developed which fully manned the line force and lermanned the rated staff by as much as 25 percent, ending on aeronautical rating (pilot/nav), level (wing, nbered AF, MAJCOM, etc.) and agency AJCOM/SOA). Only those staffs with truly unique ponsibilities or a small, geographically dispersed ıcture remained unprioritized. The supplement target fixed at around 2,450 pilots and navs, based on an lysis of the needs in several key career fields. This overall prioritization plan was used to determine manning entitlements for each MAJCOM or SOA, which in turn has developed its own internal distribution plan reflecting that agency's unique needs.

Prioritization and You

In attempting to discuss what prioritization might mean to the individual rated officer, the overwhelming bottom line is that each case will be worked on its own merit. Any individual will still be based on numerous factors, such as current unit manning versus prioritized "entitlement," the officer's qualifications and/or volunteer status, unit commander and MAJCOM inputs, and a view of the proposed move in light of what prioritization is trying to achieve from a broad perspective.

Despite this sizeable caveat, some generalities can be made concerning what prioritization will mean from a personnel management standpoint. First, rated duties will play a bigger part in career development than they have in the recent past. With reduced rated supplement opportunity being an inevitable and unavoidable by-product of the prioritization plan, extended supplement tenure and duty in career fields where rated presence is not truly critical will become a less viable option for the great majority of rated officers. Career progression through supervisory positions at squadron/wing level to staff duties at MAJCOM or even Air Staff levels will become the norm for those officers not qualified for—or interested in—those career fields where supplement opportunity remains.

A second effect of prioritization will be an increase in the average grade of officers assigned to rated duties. Following the Southeast Asia conflict, a conscious management decision was made to retain our combat-experienced rated assets—at the cost of sharply reduced nonrated accessions and abnormally low UPT/UNT rates. As a result, the rated force has matured to a point where we are somewhat heavy in field graders and short in the captain and lieutenant ranks. With full rated staff manning and the sizable supplement inventories we've enjoyed over the past few years, this had little

☞

impact – there were plenty of spaces calling for rated field graders. As staff manning and the supplement are reduced under prioritization, however, there will be some "overgrading," both in line units and in staffs at every level. While this will be quite noticeable at first – since it's a distinct change from utilization patterns established over the past decade – it should not reach serious proportions, and will slowly rectify itself as increasing UPT/UNT rates reestablish the grade balance in our rated inventory. While the utilization patterns stemming from prioritization certainly aren't optimum, they *are* decidedly preferable to the alternative that AF personnel planners in the mid 70's were able to avoid through other actions – aggressive RIFs of combat-experienced rated officers!

What's Needed to Make it Work

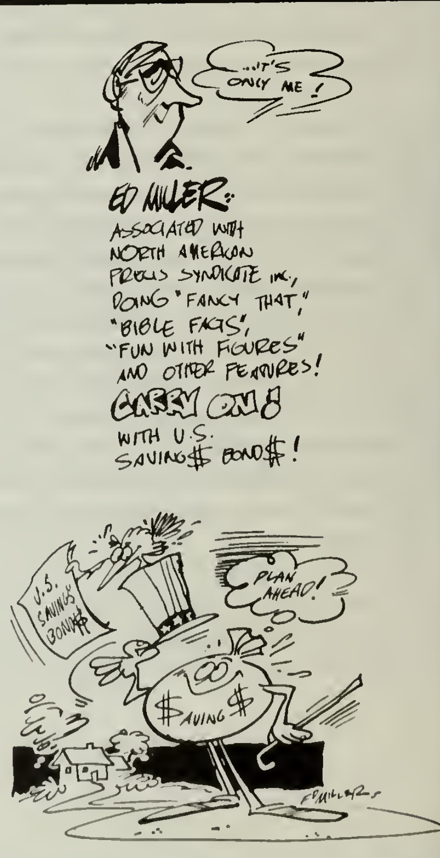
Transitioning from our current manning distribution to a prioritized structure in something less than a year won't be a simple matter. It will require close cooperation among everyone concerned and an expansive program of education so that those potentially affected will know what's happening, why, and what their options are. The drawdown of the supplement and staff agencies that have been manned at or above full authorized levels for many years will naturally have some impact. Mitigating that impact through understanding, cooperation, education, and *preplanning* is the purpose of this article and other similar efforts.

Who will be affected by prioritization? If you're currently assigned to a staff job at any level, completing a supplement tour in FY80, or otherwise "on the move" (DEROS, tour completion), you're a candidate for reassignment in accordance with prioritization directives. This doesn't necessarily mean that you'll be reassigned to an out-of-the-ordinary job or location, or even moved at all. It only means that you're among the large pool of officers potentially available to meet prioritization guidelines.

With this in mind, let's take a look at where our greatest needs for qualified officers exist during FY80. In the supplement, inputs are needed in engineering (AFSCs 26-29XX, 305X, 55XX), maintenance (40XX), instructor (0940 – principally at USAFA), and air traffic control (16XX). General ops staff jobs (AFSC 1495Z/2295 levels from wing through MAJCOM are avai worldwide, particularly in TAC, USAFE, and PACA few jobs, both rated and supplement are available i Departmental/Joint arena, as are a few in certain Se Operating Agencies. To give you a better understand what prioritization means and what opportunitie available, we'll be updating AFP 36-6, *Assign Information Directory* this summer. If you know you on the move this year, or if you're interested in one above areas, talk it over with your commander and your rated resource manager here at AFMPC or at MAJCOM a call. Getting the right people – in ter qualifications, availability, and volunteer status – in right job is what effective rated management is all and that fact is one thing prioritization won't change

About The Author

Colonel Viccellio is Chief of Rated Officer Career Management at AFMPC, and has written several articles for *Aerospace Safety* concerning key rated officer issues. His background includes tours in the F-100 and A-1 and duty as an F-4 ops officer, squadron commander, and ADO in the 33TFW at Eglin AFB, FL.



REX RILEY Patch

Optional Subdued Color Scheme

The wearing of Rex Riley patches is at the discretion of the unit commander. We have, however, received numerous inquiries about subdued patches, so we're passing on an idea for a subdued color scheme. If you go this route and are pleased, drop Rex Riley a note with a photo of sample. Rex Riley, AFISC/SEDAK, Norton AFB CA 92409.

SUDS

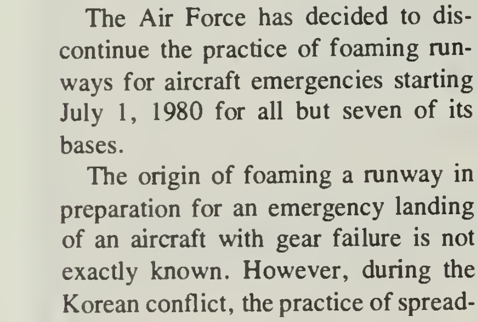
By MAJOR GLEN D. CHAMBERS
Directorate of Aerospace Safety

■ If you have to make an emergency landing after July 1, don't plan on a foamed runway.

The Air Force has decided to discontinue the practice of foaming runways for aircraft emergencies starting July 1, 1980 for all but seven of its bases.

The origin of foaming a runway in preparation for an emergency landing of an aircraft with gear failure is not exactly known. However, during the Korean conflict, the practice of spreading a layer of foam on the runway surface evolved. The foam used is actually a mixture of protein foam concentrate and water in a 6 percent solution. This means there are 94 percent water and 6 percent concentrate per gallon of foam product. The foam acts as a medium to carry water and help keep it in place on the runway surface.

The claim for using foam was described as allowing the aircraft to land on a "cloud of shock-absorbing foam." Three theoretical benefits where advanced by advocates in support of this practice: (1) Foaming reduces aircraft damage by cushioning the contact between airframe and runway, (2) Foaming reduces the coefficient of friction between the airframe and runway, and (3) Foaming reduces the friction spark hazard. Tests conducted by the US Navy showed that "(3)" was the only benefit supported by any substantial fact.



Different metals react in distinctive ways to the grinding action while sliding in contact with the runway surface.

Sparking from aircraft aluminum is not considered an ignition source. Aluminum tends to "smear" off and coat the runway leaving a trace of metal behind and does not produce sparks as it slides.

Titanium alloys produce very bright sparks when dragged along the runway. Navy tests showed that in all cases, ignition of fuel/air/foam mixtures resulted. Titanium is a definite ignition source, and foam is incapable of suppressing the sparks or resulting fire.

Foam was capable of suppressing some of the sparks associated with stainless steel and other iron alloys. Success varied from approximately 50 percent to 100 percent.

While friction sparks may s[...] the ignition source, a combustib[...] ture must be present to sustain t[...] Before an emergency landing [...] complished, the aircrew reduc[...] fuel load as much as possible [...] tent with the situation present. [...] fore, the probability of fire res[...] rupturing a full or partially fu[...] cell or hydraulic lines and havi[...] mixture ignited by sparks.

A recent study, coupled w[...] analysis of selected mishaps [...] was conducted by Headquarte[...] Force Inspection and Safety [...] (AFISC), Norton AFB, to det[...] the effects of foam versus no fo[...] reported Air Force mishaps. I[...] to enable analysis, it was decid[...] the incident must meet the fol[...] criteria: (1) Be a declared eme[...] with gear problem or any oth[...] dent when foam was laid, and ([...] mishap that results in damage[...] aircraft. This included uninte[...] wheels-up landings. Exclude[...] those that departed the runway [...] since damage would be cau[...] other than contact with the runw[...] face and could not have bee[...] vented by foam.

Two hundred and ninety-tw[...] haps were experienced duri[...] 1968-1978 period. Of thes[...] landed on a foamed surface v[...] remaining 158 using an un[...]

DUDS

nway. The study concluded:

No loss or saving of life can be attributed to foam or no foam. No fatalities resulted from the 292 mishaps.

The probability of fire, providing the aircraft remains on the runway, is essentially the same.

The two fires experienced when foam was used were minor in nature, easily extinguished by the fire department.

Three fires were experienced when foam was not used. Two of these fires resulted in no fire damage to the aircraft. The other aircraft received major damage due to the hard impact/slide with the runway, coupled with some fire damage.

Sparks flew as a T-29 landed without nose gear. Runways have been foamed for emergencies such as these, but its benefits were more psychological than real and its use will be discontinued.

Damage to the aircraft is essentially the same whether or not the runway is foamed.

When declared emergency landings were accomplished on a foamed or unfoamed runway, pilots with sufficient time to reduce or balance fuel loads, if needed, landed as safely in either case. Aircraft received about the same amount of damage. The psychological effect of foam also appears to have made no difference.

Elimination of runway foaming will save approximately $650,000 now spent annually for protein foam. In addition, aircraft engines that ingest protein foam must be removed/cleaned and inspected. Discontinuing foaming reduces associated maintenance costs and enables the aircraft to be put back into service sooner. There will be no savings in fire department manpower since the foaming vehicle is cross-manned by personnel from other crash fire trucks. Air Force is now considering other uses for the runway foaming vehicles that should result in additional cost avoidance or savings.

The seven bases which will continue using foam for runways are Travis AFB CA, Altus AFB OK, Dover AFB DE, Ramstein AB GE, Hickman AFB HI, Clark AB PI, and Yokota AB JA, in support of the highly expensive C-5 aircraft until there is a future basis for comparison with other large military aircraft such as the B-52 and KC-135 emergency landings on nonfoamed runways. ■

Who's minding the bird?

By CAPTAIN MICHAEL WETHERELL
3350 Technical Tng Group
Chanute AFB, IL

■ How many times have you heard your buddies sitting around discussing war stories? Sometimes it sounds like their daring and skill can get that jet to do anything. With their hands at the controls, the bird does magic. Maybe once or twice you've participated in these sessions yourself. Well, you guys do deserve a lot of credit – flying isn't easy, and we on the maintenance side of the house realize that. But let me remind you that other people helped make your success possible.

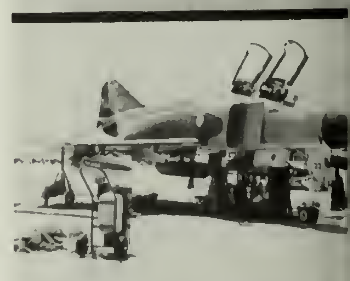
Do you remember the last time you flew? You walked out to the aircraft ready to take on the world. There, you were met by your young crew chief with a set of 781 forms. Come what may, that airman tried his level best to get you off the ground safely. Have you ever considered how valuable a service that young man or woman provides? Let me tell you a little about your crew chief.

Everyone has his own opinion of the crew chief: specialists can never find him; inspectors never get the right one for the right aircraft; support people swear he's always late for everything; pilots look out the corner of their eye at him as he explains about that little hydraulic leak; bartenders claim he drinks too much; and hostesses say he's the noisiest guy in the house. Some say he can cuss out his plane for 15 minutes, but if someone else says a bad word about his bird, he'll spend 30 minutes telling you how good it is.

Perhaps all this is true, but the crew chief is also one of the hardest workers I know. Rain or shine, he's out on the flightline working on his bird. Have *you* ever tried to hang a set of wing tanks on a broiling hot summer afternoon? Would *you* know what it's like to be so covered with grease, oil, JP-4, and hydraulic fluid that your wife and kids are afraid to hug you when you finally get home from work? Crewing an aircraft is a hard, thankless job.

Some people say the crew chief is the biggest complainer on the flightline. Possibly so, but put him in an office and he'll scream and holler even louder. The crew chief is proud of his work and he really cares about his bird.

Other than flying planes, fixing them is the most important job in the Air Force. The next time you fly, don't be in such a hurry to strap in and take off. Take a moment to say a few pleasant words to your crew chief. Pat that young airman on the back. He or she deserves it. ■



About the Author

Captain Wetherell entered the Air Force through OTS in 1974, attended the Aircraft Maintenance Officer Course at Chanute AFB and was assigned to the 363 TRW at Shaw AFB. For the next three years, he worked with RF-4C reconnaissance aircraft as a flightline maintenance officer and was then transferred to Chanute AFB where he is an instructor.

he fire's out... NOW WHAT?

MAJOR TIMOTHY D. BROWN
ht Safety Officer
gstrom AFB, TX

Often, there is a fine line between st another incident,'' and a ificant mishap that becomes an n of special interest. Recently, at would have been ''just another dent'' was pushed over the line. lowing a barrier engagement, the ot did not shut off the engines ore he egressed the aircraft. The department elected to snuff the ines out using light water foam ueous Film Forming Foam) to do The damage to the aircraft and sequent cost of repair was tively minor to that point.

Engines subjected to fire pressant agents usually require pment to depot for overhaul, and in this case. Now, the reportable t of the mishap has increased by ut $60,000! But it's not over yet. e real cost to the Air Force for this hap will include repair or lacement of any engine nponents which are damaged by corrosive affects of the fire pressant.

Chemical agents have varying rosive effects on different types of tal. They range from protein foam ghly corrosive runway foam soon eave the inventory) to Halon 1211 ich is not corrosive. The longer the ine is exposed to chemical agents hout corrective action, the greater damage will be.

The cost of engines and engine air is very high and is not reasing. Therefore, the cost of a hap can be greatly increased by

Fire suppressant applied to jet engines can result in serious damage unless proper cleaning procedures are used.

failing to take timely action against the corrosive effects of chemical agents. The procedures vary but generally include a water wash ASAP after the incident, drying, engine teardown, preventive lubrication, and expeditious shipment to depot. In the subject mishap, the engines were not water washed, were not removed from the aircraft for a month, and were not shipped to depot until four months after the fact. The actual damage to the engines remains to be seen.

There currently exists a 2-J series tech order for all jet engines except the F-100 which is still being tested and the TF-30. The general procedures in T.O. 1-1-1, Chapter 4 can be used on the TF-30. The tech order describes procedures to be followed in case an engine is subjected to fire suppressants. It is important that every unit recognize the need to apply these procedures and knows where to find the information. The chart (subject to change, of course) should help.

ENGINE	TECH ORDER	PARAGRAPH
J-79	2J-J79-46, 56	11-22
T-85	2J-J-J85-56-1	3-11A
T-58	2J-T58	11-25
TF-34	2J-TF34-6	11-7
J-75	2J-J75-6	3-30 (Note)
TF-41	2J-TF41-3	3-9A
F-100	Under Investigation	
TF-30	1-1-1	Chap 4

It would behoove each flying unit to be familiar with the required procedures to use following fire suppressant ingestion into engines. If supervisors know where the procedures are written and ensure timely compliance, we've established one more way to keep ''just another incident'' on this side of that fine line. ■

MAJOR
David M. Jones

STAFF SERGEANT
Richard R. Bobo

CAPTAIN
Andrew A. Fairlie

STAFF SERGE
Douglas F. Wy

1st Special Operations Wing
Hurlburt Field, Florida

■ On 20 August 1979, Captain Fairlie and crew were performing overwater training in a CH-3E Helicopter near Eglin AFB. They had just completed three water hoist patterns and were in a hover simulating a rope ladder pickup when the main transmission oil pressure reached 135 degrees centigrade (145 degrees is maximum allowable). Captain Fairlie began forward flight to cool the transmission. At 50 knots and 50 to 60 feet above the water, the crew heard a loud howl followed by a bang. The number two engine instruments went to zero. Captain Fairlie and Major Jones promptly performed the bold face for engine failure and began a turn toward the shore which was two miles away. Then the main transmission chip light illuminated, and fluid began running down both sides of the aircraft from the transmission area. Captain Fairlie declared an emergency with Eglin Mission Control as Major Jones sqawked emergency on the IFF. Burning fluid was now leaking into the cabin area. Sergeant Bobo called out that the aircraft was on fire, but there was no fire indication in the cockpit. Sergeant Wyman stated that the fire was aft of the engines. The pilots checked the instruments again and saw that both engine oil pressures were reading zero. Captain Fairlie, realizing he could not make land, began an immediate descent, radioed that they were on fire, and were going to land on the water. The crew prepared to ditch the aircraft. Upon landing, Captain Fairlie and Major Jones shut down the engines while Sergeants Bobo and Wyman fought the fire with the cockpit fire extinguisher. They were unable to get to the life raft or the aft fire extinguisher because the fire blocked the way so Captain Fairlie gave the order to abandon the aircraft. The crew egressed, and LPU deployments were successful. As the crew swam away from the aircraft, they saw three to four-foot flames coming from the transmission area. After approximately five minutes the fire went out, and Captain Fairlie decided to return to the aircraft. Upon boarding, Captain Fairlie used the aft fire extinguisher to spray all areas where the fire had been. He then helped the flight mechanics on board and used his survival radio to contact another CH-3 now overhead. The crew deployed the sea anchor, got out the bilge pumps, and checked the aircraft for seaworthiness. Within 45 minutes an Air Force boat from Eglin AFB arrived at the aircraft. After six hours of towing, with the crew operating the bilge pumps, the helicopter was safely recovered at Eglin AFB. The skill and prompt reactions of Captain Fairlie and his crew during this emergency prevented possible loss of life and saved a valuable aircraft. WELL DONE! ■

☆U.S. Government Printing Office: 1980—683-214/8

CAPTAIN
Chris R. Glaeser

CAPTAIN
Johnny R. Jones

50th Tactical Fighter Wing

■ On 7 August 1979, Captain Glaeser and Captain Jones were leading a two ship F-4E low level tactics mission 100 nautical miles west of Zaragosa Air Base, Spain. During the low level, at 480 knots the aircraft hit a large condor which shattered the radome, ripped eleven panels, and tore three spars on the aircraft fuselage. The bird entered the left engine intake, causing massive damage to the intake, generator housing, and compressor section of the engine. A portion of it passed between the intake and cockpits, where it penetrated the aircraft, severing electrical and hydraulic lines. Complete loss of radio and intercom transmissions from the front cockpit occurred as well as simultaneous jettison of the left outboard external fuel tank. The loss of the fuel tank, coupled with a simultaneous compressor stall of the left engine, caused the aircraft to yaw and roll. Captain Jones took control, recovered the aircraft, and started to climb. Turning towards Zaragosa and slowing to 300 knots, he directed the wingman to rejoin and confirm the damage to the aircraft. After ascertaining that Captain Glaeser was all right he returned control of the aircraft to him and continued to relay vital information to the wingman while coordinating the emergency recovery of the aircraft. With EGT on the left engine climbing and the oil pressure decreasing, Captain Glaeser decided to shut down the engine to prevent further damage. Enroute to Zaragosa, Captain Glaeser regained limited radio and intercom communications, and the crew accomplished the necessary checklist items. During the descent, the utility hydraulic pressure decreased below limits and caused significant degradation in flight control response. The crew decided to restart the left engine on final approach to improve controllability. When the landing gear was lowered, cockpit indicators showed that the right main gear was down but not locked, and the wingman confirmed the gear problem. The emergency gear extension checklist was initiated, without results. The crew decided on an approach end arrestment. Touchdown was planned to be on the left gear first, to minimize the danger of the right gear collapsing. This was accomplished successfully, and the barrier was engaged without further incident. The professional efforts of Captains Glaeser and Jones under the most trying conditions of an inflight emergency reflect the high degree of discipline and training which characterize Air Force crews. WELL DONE! ■

YES . . . YOU!

IP: BAILOUT . . . BAILOUT . . . BAILOUT!

STUD: Who . . . me?

Only minutes before, we had declared an emergency and started a descent. Our flight control problem seemed to be getting worse.

WHO . . . ME?

We had also completed the emergency check list for ejection. I adjusted straps and stowed loose items.

WHO . . . ME?

The IP reconfirmed he wanted *me* to get out of the airplane . . . *NOW*. Still . . . I coul believe it was happening.

WHO . . . ME?

I thought of my wife. I thought about be paralyzed. I thought of being afraid of dy

WHO . . . ME?

I raised the handgrips.

W H O . . . ME?

I SQUEEZED THE TRIGGERS.

. . . ME!

The next thing I remember was seeing chute above me. I smiled. On the way do I watched a fireball that only seconds fore was the aircraft I was so hesitant leave.

AEROSPACE

ETY • MAGAZINE FOR AIRCREWS

JULY 1980

THERE I WAS

By **COLONEL LELAND K. LUKENS** • Director of Aerospace Safety

■ "There I was, out of airspeed, ideas, and altitude! So I . . ."

How many times have you heard a great story start with, "There I was"? All those stories, whether told around the ops counter after a flight or around the bar after a couple of beers, were entertaining. But many were much more than just entertaining—some of the great truths of aviation have been learned by the fledglings and relearned by the older guys from the stories that followed that opening line.

The Directorate of Aerospace Safety would like to cash in on the beneficial aspects of the close calls, near misses, errors of judgment or whatever might generate a "There I was" type story. We feel pretty secure in our ability to control materiel related accident potentials; and with inputs from the people who maintain and fly our aircraft, we hope to gain additional insight into the human element accident potential as well.

The Royal Air Force (RAF) has had some excellent results from their Confidential Direct Occurrence Reporting System (CONDOR) which encourages self-reporting of those incidents where human error nearly resulted in a mishap. RAF, like USAF, accident statistics show that human failure or error is the major contributing factor in accident causation. And they, like we, also believe that many basic accident ingredients have been encountered previously in close calls or "There I was's." These experiences have remained private in the past; or if they ever were told, they were kept to a small circle at the ops counter or the bar.

We asked all the MAJCOMs' safety folks to review the RAF program, staff it through their commands, and to provide suggestions on improvements to the program and how best to implement a similar program in the USAF. The suggestions were reviewed and our proposed USAF program was revised accordingly.

This new USAF program is simple and ther very few rules to remember. Basically, we want a mous accounts of personal errors or mistakes th can publicize to warn others not to make the sam takes. The end hoped-for result, of course, is a red of our operator factor losses. The form to fill out ultimate in simplicity—a nearly blank page on we have begun the first sentence with "There I —the rest is up to the writer. The reverse side page is preaddressed to the Director of Aerospace so after the story is told, just fold, staple, and mail. sign or identify yourself or unit—we want total anon I will personally read each account. If considered priate, the lesson learned from the account and prev measures, if any, will be publicized. In effect, s airplane, save a life, tell your war story to the Air through the "There I was" program.

In return for the trouble writers take in relatin stories, they can expect an inner sense that they r contributing toward saving lives and airplanes ar they have our appreciation for their honest acco human error.

The program is not one to encourage report other peoples' shortcomings—it is not a grievanc tem, and there will be no retribution or confider breaches; the program is totally anonymous. It a program to be used in lieu of the USAF Hazard R ing Program and the HATR Program—identifie ards should be reported through standard channel inputs will receive my immediate personal atte and any items that may be useful to the operato maintainers of our aircraft will be dissemina rapidly as possible.

Sample forms will be sent to safety offices August issue of the *USAF Safety Journal* for rep tion and dissemination locally. ■

ED STATES AIR FORCE

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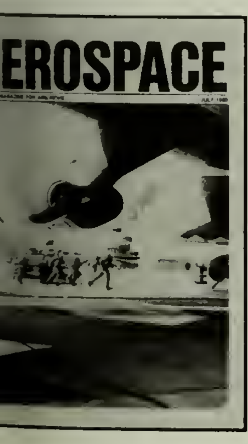

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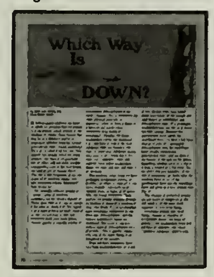

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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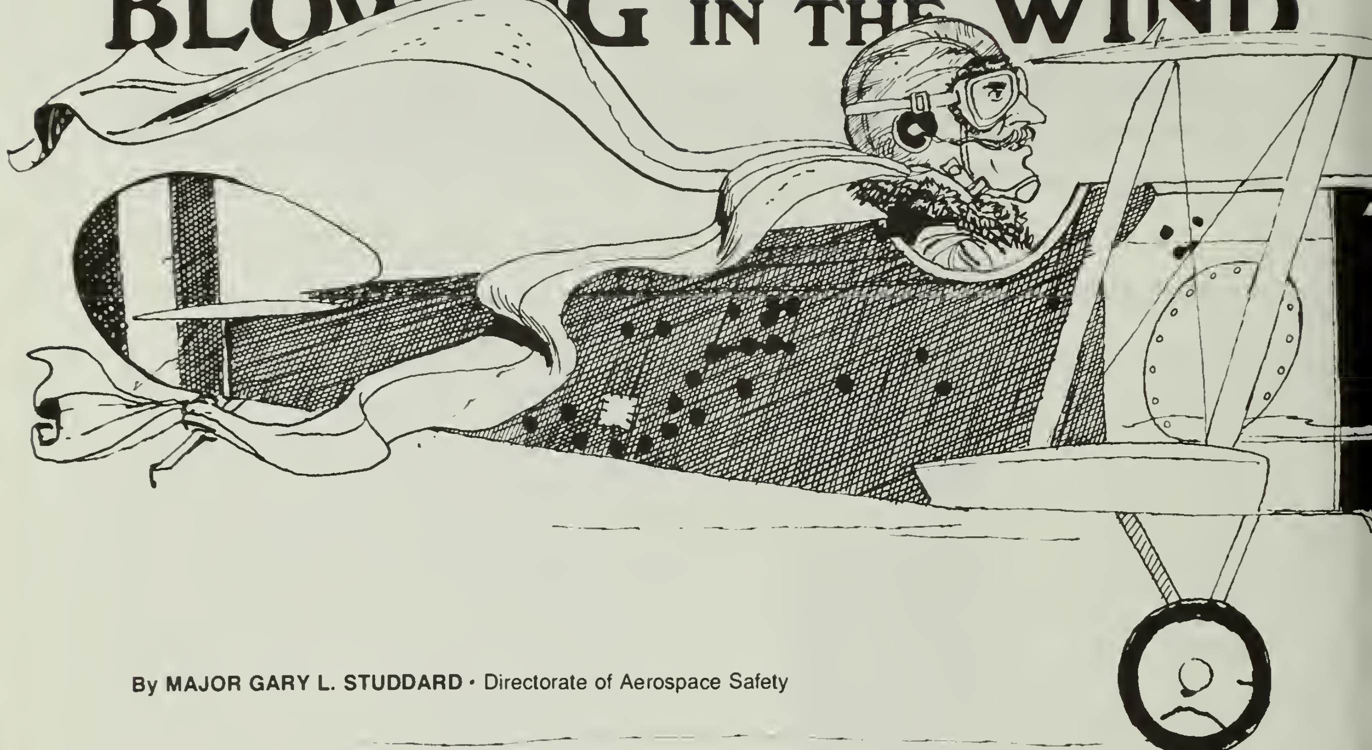
BLOWING IN THE WIND



By **MAJOR GARY L. STUDDARD** • Directorate of Aerospace Safety

■ The days of jumping in the cockpit of your aeromachine and leaping off with the scarf around your neck haphazardly blowing in the wind have long since passed. Today, nonetheless, some F-4 aviators find themselves exactly in this position of emulating our aviation forefathers. Losing a canopy at the speeds our modern day fighters fly can be a very "hair raising" experience (no pun intended).

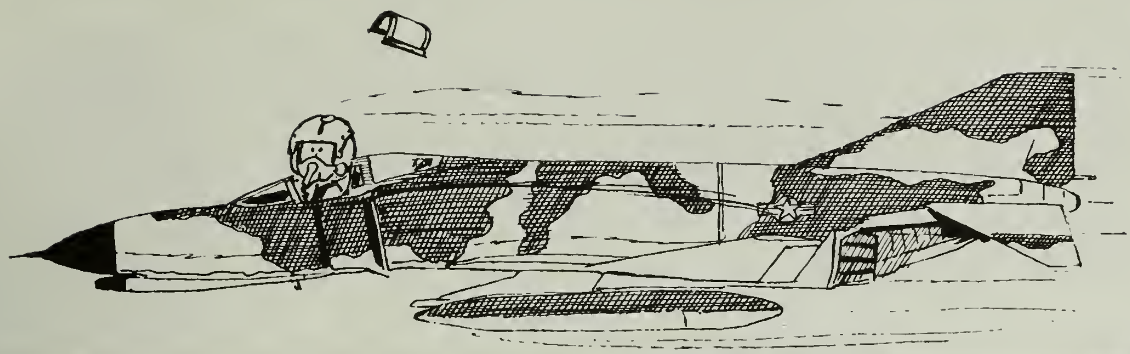
Six canopy losses so far this year caused my curiosity to get the better of me. I called upon our trusty computer here at AFISC which revealed some interesting data on the history of F-4 canopy losses. For a 12-year period (1968-79), there have been 161 USAF F-4 flight mishaps relating to inadvertent canopy losses. Yearly totals have varied from a high of 23 canopies lost both in 1968 and 1969 to a yearly low of only three losses in 1978. This makes the average loss to be 13 canopies per year. Most interesting to me was that a breakdown of those 161 losses over 12 years showed 68 percent (109) involved the front canopy. In trying to formulate a couple of paragraphs talking about all the reasons for the canopy losses, I decided the following chart would be better, and you can draw some conclusions for yourself.

F-4 Canopy Losses/Flight Mishaps 1968-79

	Front	Rear
Operator Factor	31	13
Shear Pin Failure	20	6
FOD (non-aircrew)	5	0
Undetermined	30	17
Miscellaneous (lock boxes, actuators, valves, rigging, birdstrike, etc.	23	16
	109	52

A little explanation on the chart may be useful to clarify any questions. The canopy actuator-rod shear pin exists, of course, to reduce any binding during intentional ca jettison. Unfortunately, if the sh pin fails, merely of its own acco there is a likelihood the air press on top of the actuator piston wil cause the piston to abruptly bott in the cylinder. This may jar the locking linkage to the unlocked position. Even with a broken sh pin (which you will probably recognize with a "bump" type behind you followed by an unlo light indication), quick actions o your part can lessen the chance canopy loss. Reduction in airspe keeping Gs to a minimum, and limited maneuvering are the obv recommendations. Certainly, try attempting to move the canopy l to the closed position as this ma chance, re-lock your lid.

It's definitely not my inention scream "wolf." Our shear pin inspections have received



siderable emphasis in the last few
rs, and due to this effort, our last
opy loss because of a confirmed
ar pin failure was in April 1976.
potential for a future failure,
ertheless, still exists.

n the area of operator factor, the
ses for canopy losses run the
ole gamut. Some of the more
nmon include: The pilot mistaking
canopy lever for the flap switch,
amera/checklist/flashlight striking
seat-mounted initiator, the
verbial pencil in the sleeve/
opy-opening-lever interference,
ntentionally pulling the canopy
ison handle, closing the canopy
the seat pin bag, and failure to
erve an unlock light for various,
ersified reasons.

n a canopy loss mishap, it is rare
an aircrew not to state, "of
rse the unlocked light was out
en I closed it." At least they
ceived it was. In defense of us
ators, the time the canopy is
ally closed is right before taking
runway. This admittedly is a
y time with the before takeoff
cks, formation line-up,
nowledgement of departure
ructions, channel changes, etc.
doubtedly, some aircrews may be
ing their "canopy down and
ked, lights out, stripes aligned"
to habit more than actually
omplishing a thorough check.
For the front seater, don't forget
backseat canopy unlocked light
y tells the status of the rear
opy, so don't rely on him
ning you of a front canopy
unlocked condition. In the area of our fingers or pencils being in the wrong places, the canopy lever guards now installed on our Phantoms have given some relief to the inadvertent activation— but no safety system is absolute. And by all means, don't take an aircraft with the guard missing!

"Why," you ask, "are so many losses undetermined?" All I can say is the canopy is usually pretty well "beat up" after it is recovered. This, along with the knowledge that each canopy is custom rigged to each aircraft, makes reconstruction of the event very difficult. Some expert guesses are often made as to the cause, but a lot of our mishaps do wind up in the "unknown" file.

So, where do we go from here? The "undetermined" are difficult to correct; hopefully, we will have continued success in our solutions to our early-on shear pin problems; guards on bulkhead-mounted initiators have reduced our foreign object activation; and just because of the amount of exposure, a few miscellaneous losses are bound to occur. So finally, "the ball" comes right back into the court of the operator. Vigilance along with eliminating any complacency when preflighting, closing, and opening the canopy is about the extent of an aircrew's "bag of tricks." Included within this bag has to be the tried and true (but often forgotten) procedures:

- On preflight, thoroughly check condition of the canopy pressure seals and rain seals. Look for foreign objects; check the position of the center mirror on the forward canopy.
- Take a good look at the canopy actuator shear pin.
- Taxi at speeds below 60 knots (don't forget the surface winds) to prevent damage to the canopy operating mechanisms— stagger taxi if possible.
- Before closing the canopy, set the air conditioner knob in the 2 o'clock position along with selecting foot heat on the defog-footheat lever. Keep the rpm at idle.
- Time the locking cycle— 9 seconds from activation to completion.
- Listen for any unusual noise— does the canopy close hard?
- Check alignment marks.
- If all is not right, notify egress personnel. By all means, write up any abnormalities.

To reiterate, canopy losses are a subject of continuing concern, and the canopy system definitely demands the respect of the users. Losing a canopy has the potential for a more serious occurrence, and in three incidents involving canopy loss, crewmembers were also ejected from the aircraft. Remember, aircrews may or may not be the ones responsible for the initial malfunction which prevents a canopy from locking, but the "last look" is theirs. Many losses can certainly be prevented by increased attentiveness. Just remember, letting your scarf flutter in the breeze is probably not all it's made out to be anyway! ■

PART-TIME PILOT··
FULL-TIME PROFESSIONAL

While the following is primarily addressed to Reserve pilots, it has a broad application to the active force as well. Many of us, at some point in our career, find ourselves manipulating pencil and eraser more than stick and rudder and looking wistfully at the young as they go to fly. Staff positions, attached pilots, and even the "irregulars" who are general aviation fliers, pay heed. Here's a little bit of truth, compliments of the Fourth Marine Aircraft Wing Safety Sentinel. *Our thanks to US Army* Flightfax *for calling it to our attention.*

■ All forms of aviation require a professional approach, but perhaps none require this demanding state of mind approach more than we do in Reserve aviation. As Reserve pilots we have been removed from an atmosphere in which we flew every day or at least thought about it a good deal of the time. We don't have the luxury of spending our slack time each day thunbing through operator's manuals or discussing in detail emergency procedures of aircraft systems with other pilots. Most of us may not even think about flying during the normal routine of our civilian jobs. At the same time, we as part-time pilots must fly the same aircraft, to the same set of standards, performing the same missions as our active duty counterparts. To do this safely can only be accomplished by taking a full-time professional approach to our part-time endeavor.

We must set aside the time between flight periods to fully review the procedures and limitations of our aircraft. Perhaps more importantly we must be courageous enough to evaluate our own limitations wit respect to the mission at hand, t prevailing weather, and other fa Sometimes, someone else with a higher state of readiness can pro with the mission or it may be rescheduled when conditions are more favorable. Each pilot must recognize an area in their persor readiness state which requires so greater attention. The place to discover this is on the ground.

The professional approach is something that can be turned on when you put on your flight sui must start long before that; like setting aside the time to review operator's manuals during the w making sure your flight equipme and personal survival gear are in good shape, and making a conscientious and concerted effo start thinking about flying as so you know that you've been scheduled.

We may only be able to fly p time. But we will only survive i think professionally full-time.

SPORT SCUBA DIVING
3y USAF Aircrew Members

LT COL BRUCE E. BASSETT, BSC
esearch Physiologist
\F School of Aerospace Medicine
oks AFB, TX

Sport SCUBA diving is a popular n of recreation engaged in by an r expanding number of usiasts, including USAF aircrew nbers. The summer months esent the period of peak numbers livers enjoying this form of eation and thus represents a time eview safe diving practices. Of cific concern to aircrew members ne interrelationship between ng and flying.

iew of Safe Diving Practices among the cardinal rules for safe ng, the first two are: DON'T /E UNLESS YOU ARE RTIFIED and NEVER DIVE ONE. Diving is supposed to be and for it to be fun it must be (it is never fun to be a ualty!). For it to be safe you must ully trained. If you are a certified er who took a basic course more four or five years ago you might sider taking an upgrading course nstruction (open water diver, rmediate, advanced) to find out t is new in the way of ipment, procedures and ommendations.

uddy Diving involves more than ply being in the same body of er with another individual. For ty, buddy diving means knowing another's equipment and orming a pre-dive "buddy ck," knowing how to nmunicate underwater, planning r dive/diving your plan and being to rescue your buddy if the need es. Distance between buddy rs must never exceed the distance er one can swim without inhaling at the end of a normal exhalation. Underwater visibility, terrain, obstacles, current, surge and the like dictate even closer association between the buddies.

Be Fit To Dive If you are out of condition from a long inactive winter season don't strap on your SCUBA equipment and head out through the surf or dive in strong currents. Get in shape, preferably by swimming, before your first SCUBA excursion of the season. Being fit to dive also means on any given day *don't dive* if you are fatigued, tired, hung-over (aircrews? NEVER!) or sick. Making the decision NOT TO DIVE because of how you feel physically, emotionally or because of environmental factors is a tough but absolutely essential part of safe diving.

Check Your Equipment Inactivity is as hard on your equipment as it is on your body. Check your equipment and/or have your local dive shop check out your regulator(s), gauges, buoyancy compensator (if you don't know what this is you need upgrade training). You wouldn't fly an aircraft that had been in storage for six months until it had been cleared by maintenance. Treat your diving equipment with the same respect.

Always Surface With Air In Your Tank You always land with a reserve margin of fuel — so — always end your dive with a reserve margin of air remaining in your SCUBA tank(s). Three hundred to 600 psi is a range of remaining pressure on reaching the surface that is recommended. The exact amount of

the reserve margin depends on the specific circumstances of a given dive. Diving in kelp forests or making exits through surf would dictate ending your dive at the high end of this pressure range. The percentage of diving accidents that start with a diver "running out of air" is amazing and tells those of us involved in diving safety that the incidence of diving accidents would be markedly reduced if *all* divers would surface with a margin of air on *all* dives. Of course, it is obvious that good air management requires an operable and reliable submersible pressure gauge. ☞

SPORT SCUBA DIVING

continued

Descending Feet-First This will help to ensure that you will be able to equalize pressure in your ears and sinuses. Head-first causes an engorgement of the mucous membranes of the oral-nasal passages which may reduce your ability to equalize easily. Don't continue to descend if you are having difficulty with your ears because eardrum rupture underwater can lead to severe vertigo, nausea and vomiting. These in turn may produce panic, aspiration and drowning or uncontrolled ascent and a lung overpressure accident.

Only "No-Decompression" Dives Sport diving should always remain within the U.S. Navy no-decompression limits for single or repetitive dives. If you are rusty in using the tables, practice with them *before* your first SCUBA outing. Furthermore, recent laboratory findings indicate that even the U.S. Navy "no-D" limits may not be conservative enough for the average recreational diver. Because sport diving is for fun and a case of bends is not, the following revised limits and recommendations are presented for sport divers:

A. **Revised "No-Decompression" Limits**

"No-Decompression" Limits (minutes)

Depth (Feet)	U.S. Navy	Sport Diver
20	none	none
30	none	360
40	200	120
50	100	70
60	60	50
70	50	40
80	40	30
90	30	25
100	25	20
110	20	15
120	15	10
130	10	5

B. **Recommendations**

1. Always spend a minimum of three to five minutes at depths between 10 and 20 feet at the end of each dive as a "safety stop."

2. Use total time of the dive (surface to surface) at the greatest depth attained to select the repetitive group letter for the dive.

3. Do not ascend faster than 60 ft./min. Generally slower is safer, especially as you near the surface. Obviously, to keep track of depth and time you must dive with a depth gauge and watch, and they must be calibrated and operating properly. There are NO validated decompression meters on the market that will guarantee you no problems so don't waste your cash on any.

What To Do When Everything Goes Wrong!

Your dive planning is not comp unless it includes emergency procedures. For the routine proble a diver's first-aid kit, such as the Pelican Kit, should be in every serious diver's bag. Emergency phone numbers for medical treatm and the nearest recompression chamber should be readily availab as well as plans for emergency transportation. Regarding location the nearest recompression chambe and emergency consultation in the case of diving casualties, a 24-hour/day service is provided b the Hyperbaric Medicine Division USAF School of Aerospace Medicine, Brooks AFB, Texas, a AUTOVON 240-3278 or commer (512) 536-3278.

Air embolism victims (presume a diver surfaces with the sudden onset of unconsciousness or any signs or symptoms involving the nervous system such as visual disturbance, paralysis, convulsion etc.), should be placed in a 15-30 degree head-low position, on thei left side if this is possible, and transported breathing 100% oxyg by mask to the nearest recompres facility. Time is critical, but such

tims if transported by air must)T be exposed to reduced pressure altitude. They must be, if air nsported, pressurized to sea level flown at as low an altitude as ety allows (i.e., if by helicopter). Divers with decompression kness (bends – and if you don't nember the symptoms it's time for resher training!) should also be nsported at or near sea level on 0% oxygen by mask to the nearest ompression facility. The head-low sition is not believed to be neficial in the case of bends. member that symptoms of bends nerally do not have an immediate set and may, in fact, not occur for to 24 hours after exposure.

cent findings at USAF School of Aero-ace Medicine support regulation requir- 24 hours between compressed air ing and flying.

Flying After Diving

And now the real wringer for USAF aircrew members – AF Regulations specify that you must not fly for *24 hours* after any dive (breathing compressed air). This is a conservative rule but one which is backed up by more and more evidence.

Sport divers often hear of other "rules" for flying-after diving, such as it being safe to fly after a surface interval of two, three or four hours or as long as the repetitive group letter is no higher than a D. Even at face value these rules are not always directly applicable to USAF aircrews because they specify a maximum (cabin) altitude of 8,000 feet. Recent studies at the USAF School of Aerospace Medicine investigating flying-after-diving revealed serious intravascular bubbling and cases of bends in exposures which were more conservative than any of these other "rules." Because of these and other findings, and because the onset of bends can be delayed by as much as 24 hours, the hard and fast rule for USAF aircrews who SCUBA dive must remain *24 hours from bottle (SCUBA that is) to throttle.*

Summary

Since repetition is an important part of learning, here we go:

1. Don't dive unless you are certified
2. Never dive alone
   - know buddy's equipment
   - do a pre-dive buddy check
   - know underwater communications
   - plan your dive/dive your plan
   - be able/prepared to rescue your buddy (and vice versa)
   - be able to get to your buddy immediately to help or get help
3. Be fit to dive
   - be able to decide NOT TO DIVE
4. Check your equipment
5. Always surface with 300-600 psi minimum
6. Descend feet first
7. Only no-decompression dives
   - observe revised no-decompression limits
   - use "safety" stops
   - don't ascend too rapidly
   - use depth gauge/watch – NO meters
8. Have an emergency plan
   - know first aid
   - head-low and O_2 for air embolism
   - O^2 for bends
   - nearest chamber
9. Flying-after-diving – 24 hours from SCUBA BOTTLE TO THROTTLE ■

MURPHY ON THE RAMP

By MAJOR ROGER JACKS • Directorate of Aerospace Sa

■ My story begins a couple of weeks ago. I had been working hard to check out as an aircraft commander in the B-52. I had passed my checkride, not exactly with flying colors, but, nevertheless, with a good solid performance. One day while doing some work in the squadron, one of the admin guys walked in the room and said, "Sir, the Commander said he'd like to see you when you get a minute." I said, "O.K.," and started toward his office.

"Sit down, Sid," he said, as I appeared in the doorway. "I'm assigning you to R-13 effective Monday. You'll be the AC and Johnston will be your copilot. He has a lot of experience and is a good man. In fact, a few more hours and I will probably put him into the upgrade program. Smith, your radar nav, has been upgraded a little over a year and is doing a great job. The rest of the crew are all new guys on the block. I'm counting you you to get them off on the right foot.

Sid, the way the schedule works out, you'll get one flight with them next week and then you'll all be going on alert."

Boy! What great news! My own crew. I'm going to make this the best crew to hit this place . . . and on and on went my thoughts as I floated out of the Squadron Commander's office.

Well, that first flight went just great. The airplane performed flawlessly, and even though S-01 didn't have to worry about us taking their jobs, we did okay. I slid right into the green and got the gas off the tank on the first contact. I even did it without scaring the hell out of my crew. A definite plus for crew espirit de corps. The radar got the simulated bombs on the target, and the nav, EWO and gunner successfully did their thing. Crew R-13 was on the road to success!

Last Thursday morning we showed up for alert. I was looking forward to alert since a week of forced togetherness would give me a chance to get to know my crew. I hadn't taken the time to sit down with the whole crew and discuss crew coordination. Oh, sure, the copilot and I had talked about critical phases of flight, and I know the radar and nav had discussed bomb run procedures. We had been careful to thoroughly brief our one and only mission, but we hadn't had a chance to really discuss crew coordination during various crises. I put a discussion of crew coordination on my list of things to do while on alert.

The first day of alert had been tiring. It was a lot of the usual running around, crew change over, EWO briefings, testing, and crew study. I had also started this alert stint on a sour note, like most of my previous tours, by consuming three gigantic meals loaded with stomach bulging calories.

I had just climbed into the rack when the alert horn went off. With my flight suit, boots, and jacket partially on, I headed for the truck. The navigator was already in the driver seat warming up the engine. Within a minute my crew was crunched into the truck, and we w on our way to the aircraft. I thoug to myself, Well, not a bad start. A least we haven't lost anyone yet. Now if we find the right . . . Wo The navigator must be a close cou to Evil Knevil. I just hope we get there alive. A couple of minutes l we broadslided to a stop in front o B-52. Yep, right number — must b ours.

Everyone launched into action. The guard was getting the ropes cleared out of the way, the copilo and I were scrambling upstairs to the engines cranked, and the rest o the crew was removing engine covers, pitot tube covers and getti the ground power unit running. T "Co" and I were just finishing engine starts and the "Radar," "EWO," and "gator" were tryin copy the radio transmissions to se the alert was real or practice when hell broke loose.

"Pilot," this is ground, "there fire coming out of number 3." "Fire, who said Fire," repeats an unknown voice. "Ground," this i the pilot . . . "Fire, let's get the h out of here," interrupts someone. "Would you guys shut up," yells EWO, "I'm trying to copy the message."

I tried to tell ground that the engine was shut down and I didn't want foam sprayed into the engine unless it was necessary, but the

rphone was saturated with
es – some using the call position.
ey, nav, did you copy the
sage?" "Radar, how about
?" I think it's a practice exercise,
O." "Is the engine still on fire?"
hink we'd better get out!" "To
with this, pilot, I'm getting
" "Here come the fire trucks."
e're ready to spray the engine,
No flames, but let's don't take
nces."
leanwhile, I still haven't gotten
ugh to ground. I kept yelling not
pray the engine if there weren't
cations of a fire, apparently with
e success. Suddenly, as if a white
ender flag was raised, the whole
g was over. "pilot, this is ground,
e gave that engine a good shot of
n, fire is definitely out." "Pilot,"
is radar, "simulated exercise has
been terminated by the command
t."
My reaction . . . well, there goes
3's unblemished record. Not only

that, I had about as much control over this B-52 crew as I would piloting a runaway shopping cart. I didn't even know if I still had six crewmembers somwhere on the flight line. If we could get this screwed up on the ground, a serious in-flight emergency should be a better road show than *Smokey and the Bandit*. That little talk on crew coordination I had been thinking about was sorely needed, and as far as I was concerned it was going to take place that night while the evening's activity was still fresh in everyone's mind.

We met and chatted several times in the next few days. We talked over crew duties and how each crew position should integrate with the crew concept. We talked about things like: establishing the right priorities, adopting an effective communication system that passes valuable information in a timely manner, ensuring critical events are monitored by as many crewmembers as possible so that human redundancy is optimized, and having an open line of communication. Seniority barriers and misplaced confidence where junior or nonpilot crewmembers are afraid or reluctant to question other members' actions must be eliminated. We discussed many more areas of effective crew coordination, but what is important is that we tailored them to our crew needs.

How about your crew? If you have reservations about your crew coordination, do something about it. Talk to the old heads in stand eval. Do a little research: *Aerospace Safety, Combat Crew, The MAC Flyer* and *TAC Attack* are great information sources. These magazines have published numerous articles on how to develop better aircrew coordination. Get a list of items together that are pertinent to good crew coordination and that fit your particular crew. Then get your crew together. An informal rap session works well – a little food, a little drink, and some good give and take discussions. The pay-off may be a saved aircraft or even more importantly, a saved life. ■

SURVIVAL: Drownproofing

By MSgt STEVE KRESTIAN • Curriculum Management, Operations Branch
3613th Combat Crew Training Squadron (Water) (ATC) • Homestead AFB, FL

■ At the water Survival School, Homestead AFB, Florida, the scenario for a typical water survival episode confronts the survivor with many real physical and psychological hazards. Fear, immersion, syndrome, equipment entanglement, egress injuries, difficulty in boarding rafts, windchill, dehydration, loneliness, calm, and storm are all covered in the curriculum. But even to the properly equipped and trained, the environment can suddenly become unfriendly. As the survivor struggles to overcome these hazards, one omnipotent danger awaits to claim the unwary— near drowning.

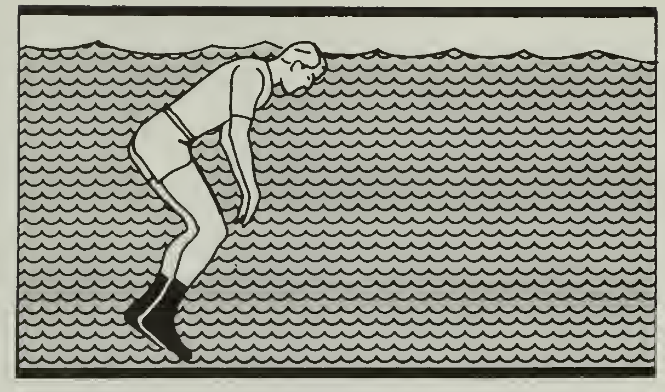
Parachute descent and a no-wind water entry, followed by suspension line involvement, can be dealt with by a calm, well-trained survivor. Trained aircrews and appropriately briefed passengers can escape a successfully ditched airframe and enter their rafts. But in the "real world," equipment malfunctions and ejection of egress injuries greatly broaden the potential of early drowning for the swimmer and nonswimmer alike. That's why a basic knowledge of drownproofing techniques can be a matter of life or death.

More than 20 years ago, the late Fred Lanoue, professor of Physical Education at the Georgia Institute of Technology, conceived and developed drownproof training. Professor Lanoue set forth a step-by-step procedure to teach a simple set of skills that would develop in any trained individual the knowledge and awareness necessary to remain alive in deep water— indefinitely.

The Lanoue technique is based on the general truths of human flotation principles and psychological indoctrination. One major objective of this technique is to eliminate fear of water as a psychological threat. The success rate of his training led the Peace Corps and Marine Corps to adopt the course as a basic skill to be learned by all personnel. In 1973, the US Army Infantry School also adopted the course. Swimming a drownproofing are not the same. Swimming instruction teaches a person how to move in a water environment. Because of the eff required to attain mobility, the duration of such activity is sever limited, and the energy drain is that the effort to attain mobility likely to reduce the swimmer's ability to survive. Drownproofin the other hand, concentrates on teaching the individual to stay af (survive) in deep water for exten periods of time with a minimum movement and mobility.

Drownproofing employs natur body buoyancy to keep the head most of the body at rest near the surface of the water. Early rest methods taught the individual to with the head out of the water. T is not drownproofing. The key to drownproofing is teaching the individual that resting with the h

POSITION 1



ler the water is neither
comfortable or unnatural.
People who say they fear water
lly fear the fact that they cannot
ch or stand on the bottom. In such
cumstances where the surface of
water is below their chin or neck,
y panic as soon as they realize the
ter is over their head or if they
ch a wave in the face. In order to
ercome this fear, drownproofing
vocates mental discipline.

Several aspects of physics form the
is of drownproofing. The first is
t 99 percent of all men will
nain at the surface in fresh water
hout moving if the lungs are full
air. About 99.99 percent of all
men will do the same. Momentum
l inertia, plus shifting floating
gles, make this statistic seem
ong. Proper instruction proves it
rect.

An average head weighs close to
pounds, so as a human floats
tically (most people float nearer
vertical than the horizontal) about
e pounds of tissue is above the
ter line (approximately eight
unds for women). These figures
general. Fat and total air volume,
scle, and clothes themselves are
factors affecting flotation. Thus,
n immersed person wants to keep
nose and mouth out of water all the time and see where he is going, he must hold up at least five pounds with muscular energy. This energy drain increases if he is wearing clothing and during every exhalation. These amounts may sound too small to be important, but over a period of time they impose a steady drain of energy and are a major cause of drowning.

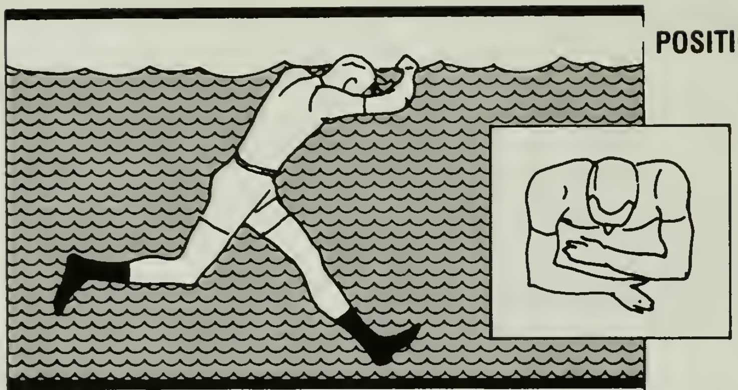
Drownproofing's answer to this particular problem is simple— why hold any weight out of water except when it is absolutely necessary? It teaches dropping down into the water for a rest between breaths. In this way, you use the natural buoyancy that exists when the lungs are full. Simple! But when you try it, it may not seem so simple until confidence is gained through practice.

With personal flotation gear and drownproofing techniques, your chances of a watery grave are reduced.

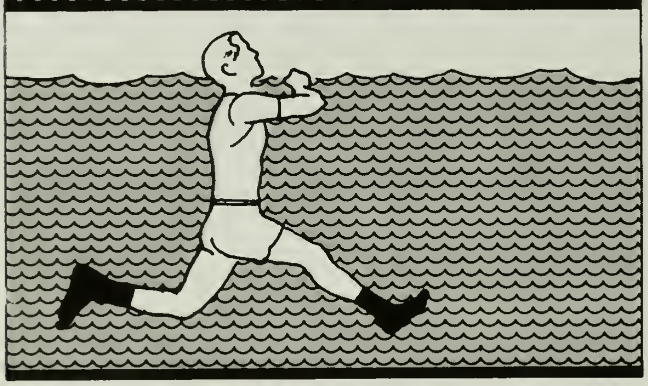
STEP 1 – RESTING Once you enter the water, rest vertically with arms and legs dangling. The head should be horizontal with just the back of the head above water (Position 1). If a learner becomes confused with up and down movements underwater, he should place his hands on his knees with the arms straight. This will help him achieve a more upright position in the water. If you happen to get water in your mouth, spit it out— don't swallow it.

STEP 2 – GETTING READY TO BREATHE After your natural buoyancy brings you near the surface, the forearms are leisurely raised to the top of the forehead with palms facing half down and half out. The forearms should be together, not the hands. One knee is raised almost to the chest and the foot extended forward with the toes pointed. At the same time, the other foot is raised behind, then extended out with toes pointed so that for an instant you are doing a front-to-back split, just like a dancer (Position 2).

If your head ducks under the water, you either raised your arms and legs too fast, blew out a little air, or lifted your head. With a gentle movement, begin to raise your head to the vertical and start exhaling through the nose. Keep your eyes shut. The exhale must neither be ☞



POSITION 2



POSITION 3

Drownproofing continued

made entirely under water nor entirely out of water. Air should be expelled throughout the entire raising of the head.

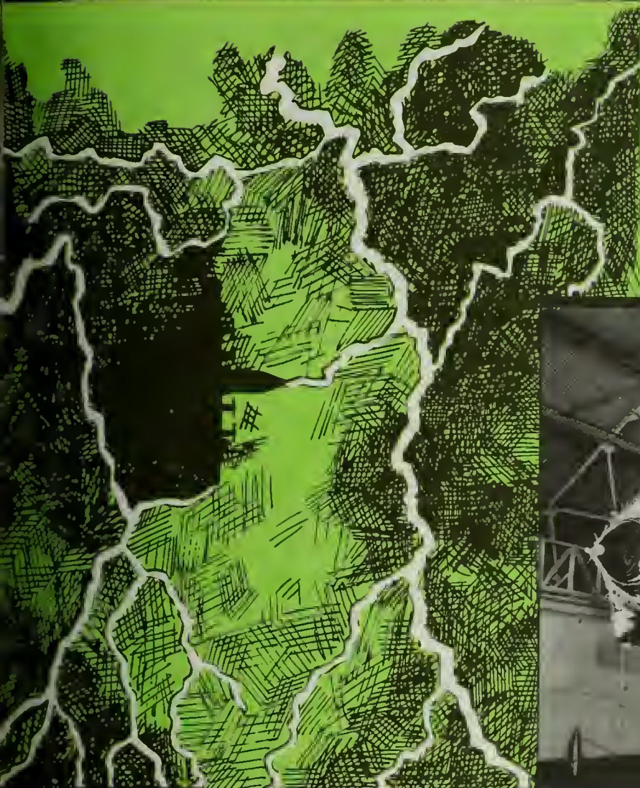
STEP 3 – THE INHALE As soon as the head reaches the vertical and the exhale finished, start your palms sweeping outward with the little finger just scratching the surface of the water. The sole of the front foot and the top of the rear foot now press down gently on the water; the mouth opens and the inhale through the mouth begins (Position 3). If the shoulder or the bottom of the chin comes out of the water, the arm stroke or kicks were too hard or fast. As soon as one has finished the inhale, he usually starts sinking. If this sinking is not arrested and reversed, it is quite possible to sink quickly to a point where the chest is compressed so much that the swimmer does not float back to the surface. To counteract this, Step 2 is repeated but with a gentle stroke using both legs and arms. Resting again is a repeat of Step 1.

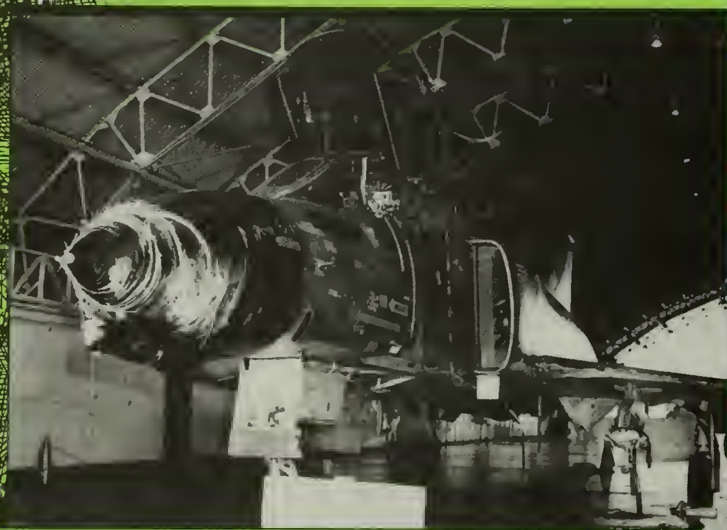
With the knowledge you have gained from this article and by practicing these three easy steps, you will be able to assist yourself (and not be a burden to others) when, or if, an emergency occurs. It is also advisable to use some type of personal flotation gear on a pleasure craft or when you egress from a disabled aircraft. With personal flotation gear and drownproofing techniques, your chances of a watery grave are reduced. ■

HE LEARN

By PATRICIA MACK
Editorial Assistant

■ I heard the door close and
out my usual greeting, "Ho
your day go?"
"Look at the front of the
That'll tell you how my day
Soon as I change my clothe
tell you all about it."
The car was a mess. As
estimating the repair cost, he
out and explained.
"I was on my way downtow
morning, and as I approache
intersection of 4th and Cent
car turned directly in front o
I hit the brakes, but there wa
way I could avoid hitting that
"Was anyone hurt?"
"There were two women a
little boy in it. One woman h
little cut on her face and the
wasn't hurt, but the little boy
pretty shaken up. The woma
the police officers that she
didn't see me and turned in
of me."
"How about you?" I asked,
don't appear to be injured. Di
have your seat belt fastened?
"Questions, questions," he
"I was kinda shaken up, bu
hurt. And, *yes*, I did have my
belt fastened."
Let's back up about five y
This same man was driving
when he suddenly, unexpec
sneezed. He reached down t
a tissue, went over a curb a
a concrete light standard jus
quickly. As a result of that acc
he had several lower teeth kn
out, his chin cut all the way thr
and numerous bruises and
spots. Was his seat belt faste
No, it wasn't. ■





Lightning 'R' US

By MAJOR TONY HELBLING
USAF Ret.

During a formation departure of s, the lead aircraft received a tning strike on the radome. The rge exited the left wingtip, ssed to the wingman's nose wheel r and exited from the tip of the t stabilator. Lead suffered siderable damage, the wing raft very little.

ilots of an F-16 and an F-4 in nation reported a similar erience with little damage.

n F-15 at FL 280 was struck. pilot received a shock in his left d, and the right engine flamed Stray voltage affecting the tronic engine control/unified fuel trol is suspected as the cause of flameout.

las your bird ever been struck by tning? How did the strike pagate? What was the resultant age . . . and what, if anything, you do about it?

he majority of lightning strikes is y benign in nature. They range n static electricity buildups to es/discharges on aircraft endages. Of the latter group, age can range from burned paint on a wingtip to the catastrophic loss of an aircraft and crew.

Based on historical data, the FAA has established areas of strike attachment on aircraft that are within 18 inches of the wingtips. Also included are external fuel tanks, engine nacelles and areas within 18 inches of the aft protuberences of the aircraft.

A typical lightning strike actually attaches itself to an aircraft as the aircraft enters the area of electrical charge. The arc reattaches itself at various other parts depending on aircraft speed and properties of the skin surface. Herein lies a possibility of melt-through which becomes a function of skin thickness, heat generated, along with insulating properties of the skin's surface and material composition.

With regard to aluminum skinned aircraft, new design standards require skin in the areas previously discussed to be .080 inches in thickness in order to withstand a possible melt-through.

A melt-through in a critical area would involve other aircraft systems such as fuel cells, flight control circuitry, or hydraulic/electrical systems.

This brings us back to — "What can we, as aircrews, do about a lightning strike?"

- Naturally, avoid areas of thunderstorm and lightning activity.
- If and when we are hit, assume some system in the aircraft may have been damaged and proceed accordingly.
- New weapons systems are designed with lightning protection inherent, while our more mature systems are more vulnerable to system damage.
- Know YOUR aircraft's limitation.

For more specific information on lightning strike phenomenon, refer to National Aeronautics and Space Administration (NASA) reference publication 1008, *Lightning Protection of Aircraft*.

Our thanks for information supplied by HQ AFSC/ AFFDL.

X-COUNTRY NOTE

By MAJOR DAVID V. FROEHLICH
Directorate of Aerospace Safety

■ Before I get into the results of the latest evaluations, I'd like to talk about good guys and bad guys. I still get letters and phone calls asking "What sets the best transient services base apart from the rest?" Let me try and pass on some perceptions based on two year's evaluations including visits to over 60 USAF CONUS installations.

TRANSIENT SERVICE PLAYERS

BASE OPS — Almost universally, the largest problem in Base Ops/airfield management is manning. The 271 career field is a mess! Not only are most places short of people, they are also short of experienced people and/ or retainability. Without a tech school, the airfield manager has a continuous uphill battle OJTing the inflow of new folks while trying to keep some semblance of "ops normal." Until the turmoil subsides, some empathy from aircrews, commanders and others can sure help the situation. Aircrews — realize that most Base Ops are having personnel problems and save a few extra minutes, look up the info yourself, write a little clearer, etc., etc. All those things (and others) save time and confusion behind the dispatch counters. Commanders (at all levels) — realize there are problems in a lot of Base Ops areas and if you can lighten the load (nav kits, local flying schedules, FLIP distribution, etc.) you might offer some help. One commander had gone back to something like the old AO (Airdrome Officer) idea. A young aircrew member pulls an additional duty two days per week for a month in Base Ops. With the right attitudes — everybody wins. The crewmember adds a current knowledge of airplanes to the behind-the-counter environment. This helps the young and inexperienced dispatchers relate their work to the actual flying a little better. The crewmember also gains by picking up a much more thorough understanding of how the whole airfield runs besides just his airplane. Things like lighting, air traffic control, flight plan processing, RCR checks and all the other stuff that most of us took for granted for years. Like I said — it can be tough to set up, but with good attitudes by all, it can be very beneficial.

Other than personnel, the key to a top-notch airfield lies in the working relationships between the airfield folks and the other agencies on base that support the Base Ops and runway environment. Agencies such as POL, civil engineering and the motor pool can make or break Base Ops. In many cases, a "Rex Riley committee" or "transient services working group" has made great strides in getting all of the players talking in a "no threat" environment.

BILLETING — The key to separating excellent and ho-hum billets lies in *supervision*. The really top installations in the transient quarters category seem to have supervisors that are out and visible. They are watching and working the counters to prevent problems; they have a r inspection plan to check for maintenance and equipment problems; they have a sort of q control program to spot check (room cleaning, etc. The best se is provided where billeting folk know and understand aircrew problems with regard to meals, transport and especially crew re Again, the committee approach seems to help.

FOOD AVAILABILITY — The r live flight line snack bars have to re-appear. This is strictly wh the commander realizes that no is this a health and safety requirement for aircrews, but a awfully nice addition for all the who live and work around the f line. If you are stuck with mac at least make sure the room do turn into a "no-man's land" w nobody cleans. Even if it has t added as a small paragraph to a commercial cleaning contract, i needs to be kept neat and clean not by the Base Ops 271's). In kitchens would have to be give rising 7 on a scale of 1 to 10. I are really improving and puttin fast, good lunches and meals. key is attitude! One thing that inflight supervisors should chec info (phone numbers, menus an locations) posted in Base Ops? could save you a lot of "no-no lunch orders.

REX RILEY TOP FIVE (MAY 1978 - MAY 1980)*				
Base Ops	Billeting	Transport	Food Service	TA
Eglin	Peterson	Peterson	Offut (inflight)	Buckley
Offutt	Eglin	Hill	Tinker (snack bar)	Tyndall
Buckley	Tyndall	MacDill	Eglin (inflight)	Laughlin
Patrick	Offutt	Andrews	Peterson (snack bar)	Randolph
Westover	Scott	McChord	Cannon (snack bar)	Maxwell

*Based on personal evaluation visits and aircrew critiques received.

:RANSPORT – I'm not ringing the na-donna bell, but aircrews often e some unique and very time-sitive transport requirements npared to the day-to-day traveler. nsport folks need to talk to neone about crew duty day, crew t, show times and the like. The t places are the ones with vehicles l drivers dedicated to Base Ops. ain, the key is a good relationship ween airfield management and isportation. P.S. Shoot for 100% ernment vehicle seat belt use!

RANSIENT ALERT – Last, but tainly not the least important! TA) has manning problems in many ations, and they also suffer from ne experience level imbalance. ks (aircrews, commanders, ntenance supervisors, etc.) need ealize that transient maintenance sonnel are not your run-of-the-l mechanic. A sharp TA vidual is part POL expert, trician, jet mech, hydraulics cialist and crew chief – and on where from 25 to 50 different raft ranging from a shiny new 6 to the 1952 model T-bird (or er). Add to that the duties of taxi er, marshaller, scheduler and -time diplomat – now you have ! Because of this myriad of tasks, quality of people that do well in is quite high. The common ad among excellent TA outfits is ude or desire. The places that ly take pride in good service ally give good service. They work l at having T.O.'s and being wledgeable about lots of different hines. For them to have to put eflight not accomplished due to lack of qualified personnel'' in your forms would be a personal insult – not a crutch. They also have super rapport with the motor pool, POL and Ops.

OVERALL – The name of the game, no matter who you are, is you've got to care and pull together to provide safe, efficient service.

NEW TO LIST

HOLLOMAN AFB – This is a hard place to get in and out of with all the "R" areas, mountains and traffic. Once you get there, however, the service and facilities are super. Call ahead for an RON and watch the traffic in their multi-runway operation.

ANDERSEN AFB – Not exactly your average weekend cross-country stopping place, but we've been told that these folks work hard to take care of those who stop thru. Glad to have you, and keep up the great service.

RAF BENTWATERS – We received an excellent report on Bentwaters and are pleased to add them to the list. Rated top-notch were ATC services, transport and billeting. Keep up the good work.

RAF UPPER HEYFORD – Another excellent report. Outstanding areas included ATC services, Base Ops, messing facilities and TA. Special note was made of super service oriented attitudes of personnel in all areas. That's the key!

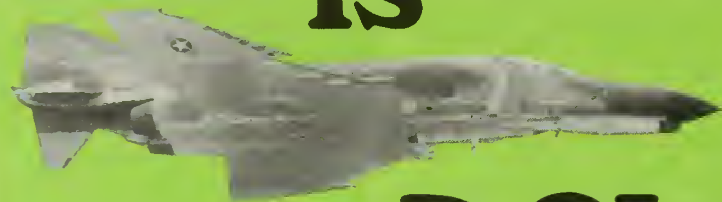
That's a wrap for this trip. We're still winning, but it's only through a cooperative effort. Keep the info coming – write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

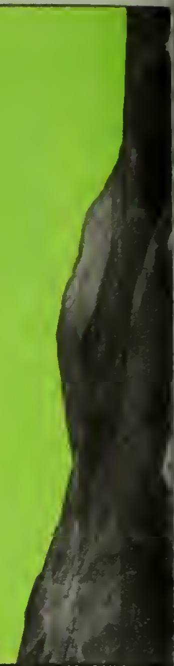
THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso, FL
DOBBINS AFB	Marietta, GA
RAF BENTWATERS	UK
RAF UPPER HEYFORD	UK
ANDERSEN AFB	Guam
HOLLOMAN AFB	Alamogordo, NM

Which Way Is DOWN?





By CDR V.M. VOGE, MC
Naval Safety Center

■ Somatogravic illusions are those in which we perceive that our aircraft is in an attitude which actually is the resultant of various force vectors that may be in a direction and/or of a magnitude different from the normal gravitational force. Sound confusing? We'll try to clear it up for you. This illusion has already killed too many aviators, and there is no guarantee that its effect will not strike another unsuspecting crew in the near future. No need to get an anxiety attack! This one is *not* dangerous, *if* you are aware of its insidious nature, and take corrective actions. Interested? You should be!

We normally consider gravity as a "stable" point of reference—something we can usually depend on. We're quite used to it, and we accept it for what we think it is. We regard it as a vertical force (at least, most of us do). As you may or may not remember from your basic physics classes, gravity is actually a force of acceleration perpendicular to the earth's surface. This is essentially the same physical principle we experience when we have a linear or a translational acceleration (remember drag-racing at stoplights?). Usually, the linear acceleration curves are shortlived—e.g., you have to stop at the next stoplight, there are bumps in the road, or even your childhood swing only goes so far. When this is the case, our "infallible" brain can separate these added acceleration forces for what they are, and there is no problem.

The problems come when we have prolonged acceleration curves, or profiles—as when we take off in our trusty aircraft—*especially* so on catapult shots, at night, or in severe IMC (no visual reference). These profiles are usually obtained through no increase in thrust or a decrease in drag. Our *Mode X-1-A acceleration input separating mechanism* in our brain gets short-circuited, and the various acceleration inputs are combined. The result is our *new* vertical point of reference (our *force of gravity*). This is another reason why *seat of the pants* flying is so dangerous to the unwary.

Even our basic maneuvers texts way back in preflight gave us a hint of this illusion when they talke[d] about load forces on the aircra[ft] load factors in coordinated and uncoordinated turns. In a prolo[nged] coordinated turn, we feel as if [we're] not even turning. Because the gravitational force equals the centrifugal force, we have a ne[t] change of zero. In a prolonged uncoordinated turn, the centrifu[gal] force usually exceeds the gravitational force, and we slid[e to] the outside of the turn (or the i[nside] depending whether we're in a s[lip or] a skid, a banked or a flat turn) [...] the drift? (No pun intended.) If [the] turn is prolonged, our brain tak[es the] resultant force vector of the gravitational force and the cent[rifugal] force and gives us a *new* vertic[al (see] Fig. 1).

The changes in perceived ve[rtical] are not nearly as dangerous in [the] roll mode as in the pitch mode[,] especially in low-level flying.

In normal straight-and-level flying, without accelerative or decelerative forces, the force o[f] gravity is the predominate forc[e, and] we have no problem. Our trust[y] "glutimus maximus" (pant's s[eat)]

the uninitiated) faithfully tells us ere mother earth is located.

ing a prolonged acceleration, by easing our power setting or by ucing drag, a force is pushing us k into our seats, and we feel as if are pitching up. The resultant e is aft and down (our new tical), as in Fig. 2. The opposite urs if we decelerate, by reducing ver or increasing drag. (Have you r double-checked your altimeter VSI, after putting out the spoilers. make sure you weren't losing tude, or pulled the stick back to intain altitude only to find rself climbing?)

For those of you who like a inite mathematical equation to tell 1 just how affected you will be l when— forget it! Just how ected each of us becomes varies h each of us as individuals, how feel on that particular day, and to ke matters worse, it may take up a minute for the illusion to be ly established. Figures 1 and 2 are t gross estimations. A catapult nch, which usually gives us about G (50 meter/second^2) peak for 2-3 onds, can also give us an oneous sensation of a noseup tude for more than a minute! This s the primary cause of our loss of ny naval aircraft several years ago er catapult launches on dark hts. The planes would essentially into the water shortly after a npletely normal launch. Since the se of these "unexplained" shaps was ascertained, general tructions for climbout after such a nch were modified. We have lost y few planes since. However, we still losing aircraft simply cause the pilot in control doesn't k at and believe his instruments! t, these illusions affect not only high performance jocks. As little 0.2G, if sustained for several nutes, can make even you helo l patrol types feel as if you're mbing, or at least in level flight, en in reality you could be losing

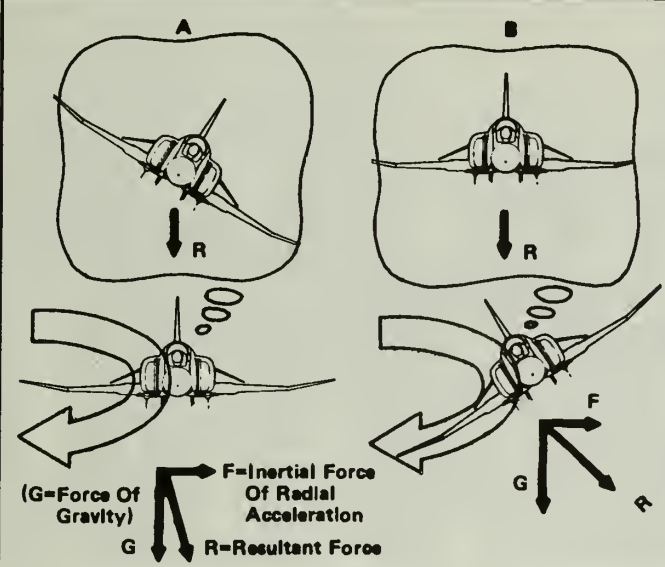


Fig. 1
False perceptions of attitude—the somatographic illusion—in a turn. The aviator equates the sustained resultant (R) with the vertical. Hence, in a flat turn (A) he may feel as if he were being rolled out of the turn. In a coordinated turn (B) the resultant is aligned with his Z axis and he has no sensation of being in a banked attitude.

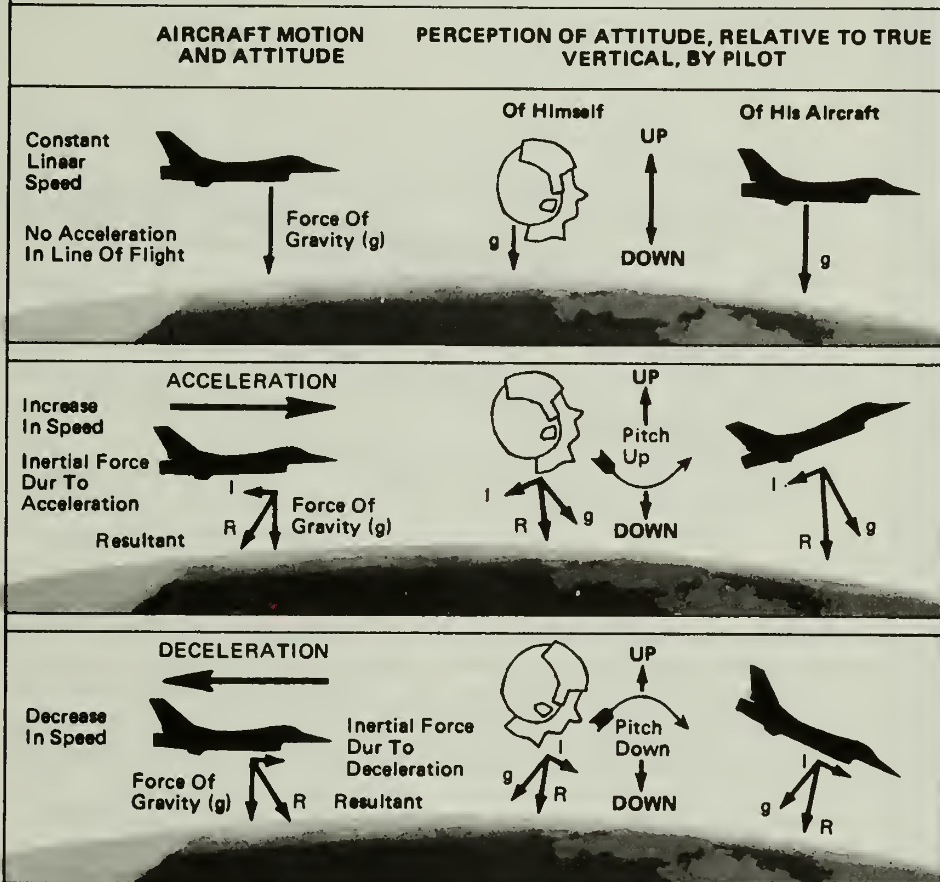


Fig. 2 Somatogravic illusions during linear acceleration or deceleration in the line of flight give errors in the perception of pitch attitude.

altitude rapidly. This could be bad news for you on a low-level mission, or a dark night, or in severe IMC conditions.

Sound bad? It can be worse! If you experience the somatogravic illusion on takeoff or when you're worried about overshooting an approach (again, especially so at night or under poor visibility conditions), you may feel as if you're climbing or in a pitch-up attitude. Response? Push the stick forward, of course! No time to check altitude— too low! Get the picture? ☞

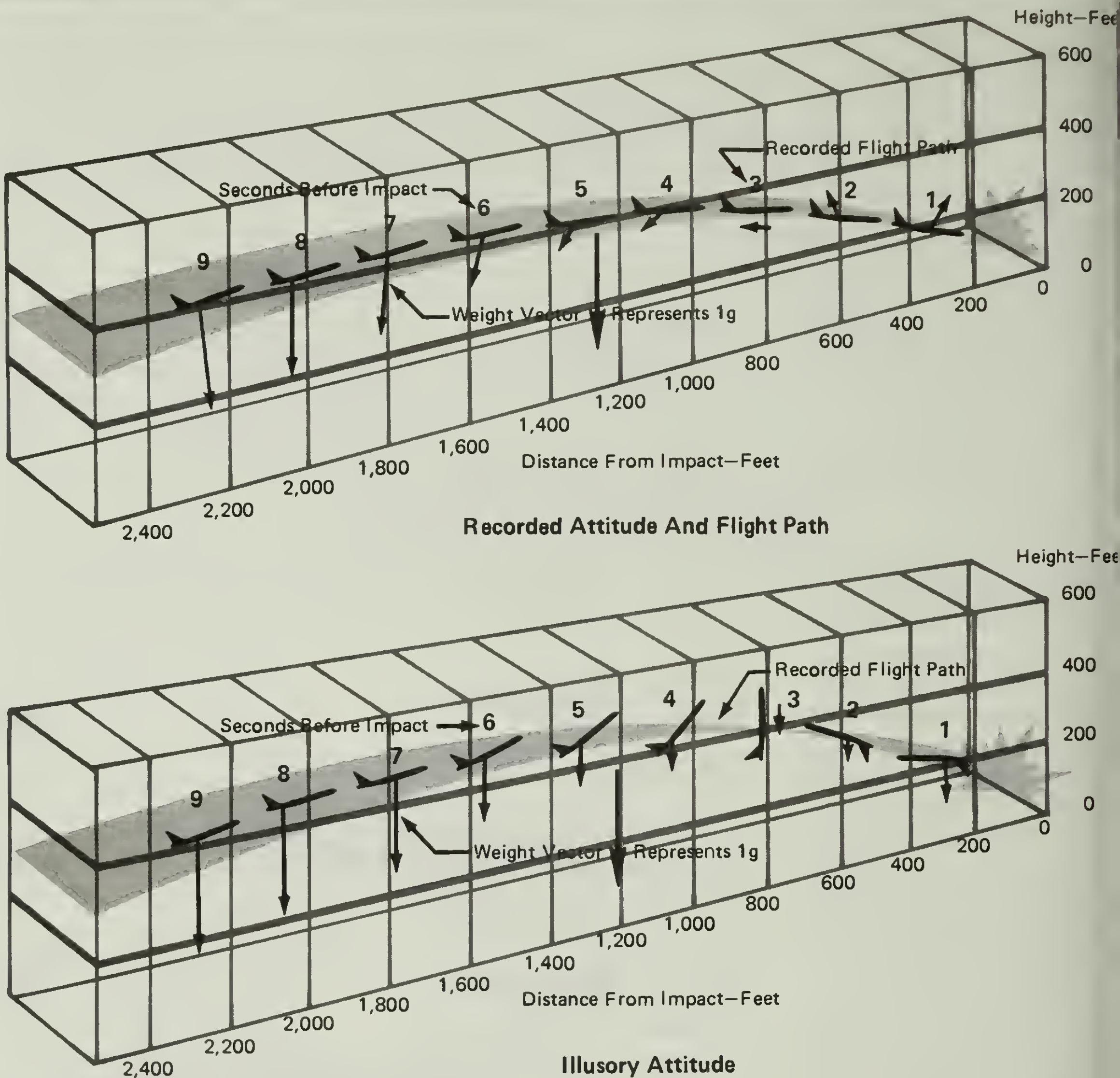


Fig. 3

Recorded flight path and calculated force (weight) vector of an aircraft which crashed after initiating an overshoot. The initial change in the direction of the force vector was caused by acceleration in the line of flight. Later, the curved flight path introduced a radial acceleration and was responsible for large changes in the direction and magnitude of the force vector. Over the relatively short time scale in which changes in the force envir occurred, it is unlikely that the illusion perception of attitu as erroneous as indicated in the lower half of the figu illusions of the form shown have been reported during comp bunt maneuvers.

Things are usually worse if we decide to decelerate or accelerate during a banked turn. We now have two added accelerative forces, instead of the already-dangerous one. The resultant force vector gives the *seat of the pants* pilot a perceived vertical that is even farther from the truth. We make what we feel to be a corrective response, but the noseup attitude seems to become more severe, rather than becoming less. We're tempted to push the stick a little further forward. This increases the tightness of the bunt maneuver, with further rotation of the force vector. We may even be exposed to negative G. Confused on the outcome? Well, those pilots who have been lucky and high enough to be able to recover from their illusion have reported that they felt as if the aircraft had pitched up and flipped over on its back (see Fig. 3)! Recovery was finally made with the plane actually in a near-*vertical* dive, several thousand feet lower tha when everything started!

As usual, we will tell you ho prevent making yourself a statis our computer once you suffer t illusion. Scan your instruments repeatedly. Do not rely on wha *feel* to be your orientation or at Double-check your instruments *believe* the instruments! There's *always* time enough to save yo skin, if you only choose to do s Courtesy May 1980 *Approach*.

THE OTHER PILOTS IN THE AIR FORCE

MAJOR MICHAEL T. FAGAN • Directorate of Aerospace Safety

The official Nomex-covered Air ce pilot gets a lot of attention in magazines and from the safety ce, but there are several thousand ou other pilots associated with blue suit, and this article is essed to *you*. About four sand of you are members of Air e aero clubs (not counting endents, retired, and other bles.)

o doubt there are at least that y more general aviation pilots ng out there of which we have no ific knowledge. The safety folks about a few of you each year reports of fatal accidents. If you ot belong to an aero club and are involved in an accident, you will ably remain uncounted. ortunately, this also means that it rd to communicate with you.

article may seem aimed arily at the aero club flier, but it tually intended for all you ral aviators in, or associated , the Air Force.

he Air Force wants you to be ested in flying. Aviation is what re all about. Whether you are a , maintenance person, cook, or ndent, your involvement in tion and knowledge of flying e us a more tightly knit munity and a better, more efficient outfit. It's logical that you should be interested in flying. If you weren't, you would probably have joined one of the other services. What better way to develop (or improve) interest in aviation than by actually being a pilot? It's expected that a lot of you want to fly, and that's what the aero clubs are there for.

They are not only there for your edification and enjoyment, but also for your safety. They work. The aero club safety record is about twice as good as that of similar general aviation. Last year 10 blue suiters were killed in light aircraft accidents. No one was killed in an aero club aircraft. Already in 1980 there have been four Air Force fatalities in non-aero club flying accidents, and none (so far) in the clubs. This should get your attention . . . safety is one of the first things a pilot looks at when he selects a plane or plans a trip.

Consider it. Other things being equal, wouldn't you choose the aircraft with the better safety record? Even though you fully expect not to crash, don't you wear your seat belt? When you say that that one thousand foot sod strip is tricky to get in and out of, don't you really mean that it is more risky? Sure . . . you can handle it, but there is a greater chance of a problem cropping up. The bottom line is that all pilots know they are operating in an environment which presents increased risks. There are very few "fender-benders" in airplanes. Most aircraft mishaps present a high probability of injury or death. Pilots recognize this and compensate for it with caution and discretion in their choice of equipment and flying environment as well as in their conduct while airborne.

So, if you are an aviator but not a member of your local aero club, give a thought to joining. You will find it convenient, relatively inexpensive, and significantly safer than the general aviation community at large. Part of the reason for the better record is carefully maintained equipment. Another factor is that many aero club birds are equipped in a manner which would be well beyond the means of most of us, in addition to facilities help, i.e., runways (*big* runways!) weather service, lights, etc.

Supervision is a major factor. The very regulations that might seem to be a reason not to join the club are really a positive factor. Like your seatbelt— they may restrict you a little, but they will keep you alive in the pinch. This is not only

THE OTHER PILOTS

continued

demonstrated by comparison of the aero club record with that of general aviation, but by analysis of the accidents which have happened within the clubs themselves.

That brings us to the bad news. USAF aero clubs have experienced seven accidents this year, compared with five by this date in 1979. Of those seven, three involved clear violation of club regulations. Two were wire strikes and one involved photo-recce on a one-horned moose.

It should go without saying that certain acts, such as hitting wires or flying up a narrow canyon, are unwise and dangerous. Experience, however, has shown that even the obvious needs to be stated. In fact, a great deal of the body of flying regulations is the direct result of mishaps caused by failure of common sense. "Everybody knows" not to do something, but after several folks do it anyway, with predictable results, the option to be unsafe is restricted by regulation. This does two things: it capitalizes the results of experience and it gives supervisors the opportunity to impose a penalty for recklessness which is less severe than the results of an accident.

Flying regulations will not prevent all accidents. Material failure will still be with us, as will lack of experience, to name just two of the prevalent causes of accidents. And there will always be those who will not follow the regulations, or recognize that they are the distilled essence of painfully learned lessons. But, had basic regulations been followed, the aero club accident rates for 1980 would have been better than last year for a period in which general aviation accidents are running 55 percent ahead of the same period of 1979. Adherence to the regs would have prevented these unexcusable and expensive mishaps, as it has undoubtedly prevented others not suffered because the vast majority of aero club fliers know and comply with the regulations they have agreed to follow when they signed up.

Besides the three accidents caused by unauthorized low level flight, aero clubs have had three engine failures resulting in accidents, and a landing mishap which is still under investigation. In one case of engine failure, the pilot may have erred in judgment, as he had ample warning that the engine was acting up, but elected to continue a sightseeing flight in the mountains.

All of the four general aviation fatalities to Air Force personnel display lack of judgment. In January, one of our number was ferrying a Cessna at night. He ran into hazardous weather and elected to press on towards his destination rather than turn back. The aircraft crashed, and the pilot was killed.

In April, on the other coast, an airman had filed day VFR to a resort area in the mountains. Enroute, he was advised that weather was worse than originally forecast, but he, too, elected to continue, despite a pirep that another pilot "sure wouldn't recommend VFR . . ." to the destination. Two miles south of his intended landing point, the aircraft crashed into a mountain and was not located until the following day. The pilot and one passenger (non-Al
sustained fatal injuries.

In the third mishap, two blue suiters were killed. The mishap had driven, at night, to a local airport to show three friends the remains of a single engine aircr had crashed without being injur week before. For some reason, decided to demonstrate his prov as an aviator in a light twin par the field. He had neither the ow permission nor any known expe in twin engine aircraft! Two of fellows, apparently considering airman's recent track record, deferred, but a third went along the ride. After a short flight, th aircraft crashed nearly verticall both occupants were killed.

No amount of regulation sho direct intervention before the fa could have prevented this last

An airman crashed this airplane, th week later stole a twin engine a and crashed shortly after takeoff. a passenger were killed.

aero clubs offer many benefits: Good aircraft, maintenance and instruction, relatively
es Safety record is about twice as good as overall general aviation.

ple. Who could have predicted he mishap pilot would do what d? As to the weather fatalities, fall into an unfortunately iar pattern, as do the low level ıps. The common thread in all accidents is failure by the pilot ercise basic common sense. ted, most violations of good nent are neither discovered nor hed with an accident. Most of me we get by with it, but each ese mishaps could have been nted by the exercise of nable caution. Sometimes that on is legislated by regulations. times it's a characteristic you ssumed to possess when you are ded a pilot's license and which beyond the letter of regulations.

ing timid and being a pilot are st mutually exclusive sitions, but where is the line between lack of caution and of timidity? No pilot wants to be l either timid or cautious. So, ave come up with words which cceptable to our egos and which nstrate a proper respect for both irframes and our lives. They are fessionalism'' and ''air line.''

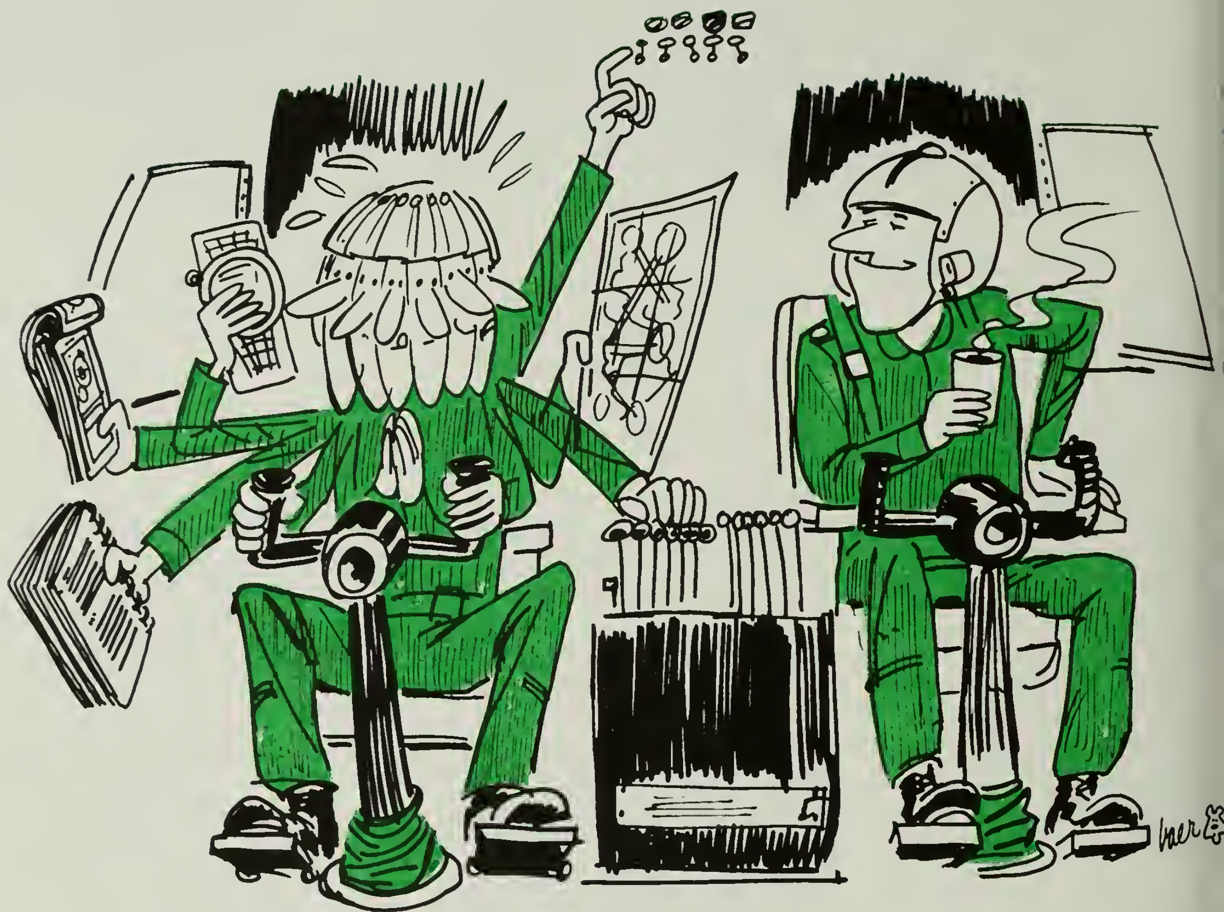
fessionalism begins with the nition that your pilot's license s with it not only the freedom form acts not given to mere ls, but the responsibility to be at those acts. That means ledge and judgment. As a pilot, re responsible for knowing your ne's limitations and your own, ou are responsible for ensuring either are exceeded. Demanding than you or your aircraft are designed for will shortly result in an accident. Having accidents is not the mark of a good pilot. While a crash may be a spectacular ending to a flight, the impression it leaves on your friends is not what you had in mind when you took off. Good pilots are decisive individuals. Two of the hardest professional decisions to make are the decision to turn back and the decision to refuse to show someone just how good a pilot you are.

Air discipline begins with thorough knowledge of the regulations and full acceptance that those regulations were written for your benefit and safety. There is no ''Mr. Grinch'' at FAA or your aero club whose pleasure it is to keep you from having fun in your airplane. The regulations were written to ensure. insofar as it is possible, the safe, expeditious progress of air traffic. Failure to know the rules is no less dangerous than failure to follow known directives. The result is the same: risk to life and equipment, and inconvenience to those following the rules.

This is the bottom line. If you are a general aviation pilot, you are one of many thousand associated with the Air Force. Your participation in flying activities makes you a better, more knowledgeable member of the team. The Air Force is vitally interested in your safety. If you are not a member of an aero club, please consider it. There are several good reasons for being a member, not the least of which is a proven safer flying environment. Whether a member or not, as a pilot you have a responsibility to be the best possible aviator. This means not only having highly skilled hands and feet, but developing professional attitudes and practicing air discipline.

Remember . . . none of the pilots who had accidents expected to have them when they left home. You may not be able to avoid an engine failure and subsequent inelegant touchdown in an unprepared area, but you can avoid hitting telephone lines. Or finding yourself up a canyon without space to do a 180. Or icing up on what started out as a VFR flightplan. Why not fly smart? ■

The Care And Feeding Of Copilots



■ This article is (or was, anyway) primarily about multi-pilot aircraft. But, before you flip the page and press on looking for something about G's and stuff, read on awhile — some of this may just apply to some of your dealings with navs, booms, loadmasters or even wingmen. What I'm interested in, is talking to the individual who finds himself (or herself) in command of an aircraft. A multi-person aircraft requires a special kind of coordination and communication. That communication includes both verbal and non-verbal between the two pilots, and that is the crux of this article. Having flown in different environments (B-52, F-4, T-33, T-39), I'd like to pass on some thoughts about the treatment of an often berated minority group — copilots.

As an aircraft commander, you are automatically part instructor. You may not have the "I" in front of your title, but the copilot is your student, and what kind of pilot or aircraft commander develops is up to you. The first and most important point is the age-old leadership by example trick. It's going to be pretty difficult for you, as an AC (or IP), to hammer or critique a reg or procedure bust if the "co" has been watching you set the same bad example on previous flights. So the first corollary in the proper care and feeding of copilots is to have your own act together. A professional, knowledgeable aircraft commander sets the tone and standards for th entire crew, especially the copilo Don't confuse that with dictator tyrannical or obnoxious; I've me those three folks also.

Part of the knowledge you mu have stored in the active section your mental computer is a thoro understanding of the duties and responsibilities of your copilot. I won't say you can't, but I will s that it is an uphill battle for you properly train and supervise a co if you haven't been there. Either way, you need to know what's t done by the right seater in order guarantee maximum efficiency a safety together up front. So, the second corollary is — know his (her) job!

MAJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

Next, I think one of the most ortant tasks (and often the hardest emember) for an aircraft mander is to let the copilot do job. Example — I think that for a 2 copilot to be really good is one he most challenging and difficult t seat jobs in the USAF. The upant is part flight mech, dmaster, fuel specialist, flight ineer, radio operator and low l navigator. And in his spare e, he has to be proficient at flying machine, too! You give him all to do and the average scientious "co" will attack the blem and do pretty well. vever, you, as the AC, need to e patience and a certain amount rust that the tasks will be omplished properly and at the t time.

Don't jump in on frequency nges, checklists or systems functions. Things may not go as as they would for you, but he's ning. Besides, some dark and wy night, when you've got your ds full of sick machine, you are g to grit your teeth and trust the ilot to do it alone anyway, so 'd better let him practice. This is empered, of course, with gment because, as I mentioned ore, you have to be part IP and de "just how far do I let him go?" ess what I'm saying is that ing destroys the initiative and fidence of a copilot faster than to e the left seater continually lping out" by jumping in or inding of tasks. It's like fudging readings on a VFR PAR — 're not helping anybody.

A last pearl of sage wisdom would be to let the "co" fly the machine — no, belay that — *make* him fly the machine! Here's where part IP again enters into the scenario. If you want to think of it as life insurance, go ahead, 'cause it is, You may be the AC that "it can never happen to me" and has the 40 pound vulture land in his lap through the windshield in the traffic pattern. That's when it will be kind of nice to confidently sit back and let the "co" crack the 200 and ½ and bring you (and the rest of your mob) home.

To be able to do that, you had better start giving up as much actual

An aircraft commander is automatically part instructor pilot.

stick time as the law allows until you see the desired level of proficiency emerge. Then, make sure there is more than adequate practice. Your experience will overcome rustiness in many cases, but often a copilot doesn't have that experience reserve to draw from.

When the copilot is flying the machine, insist upon preciseness and professionalism. Again, this should be done in a way that doesn't detract from the training value. Anyone who's ever had a "screamer" with him knows what I mean.

The crews that I have flown with or been on showed me one major point which I feel is worth repeating. A crew aircraft is just that! Every single body on board has a place and function in the mission of the machine. The two critical elements of crew flying are communication and coordination. These include knowledge of and respect for everybody else's job plus an atmosphere of cooperation. Crew flying should be a no-threat environment in that the nav or copilot should not feel threatened when reminding the AC of an altitude and checklist item, and the AC needs to let everyone know he appreciates being reminded.

The copilot can be either an asset or a liability in the tough situation involving mission accomplishment, despite weather, systems malfunctions or other adverse conditions! How he will perform then depends on how he is trained and supervised now. We have lost some good machines and killed some crews because of confusion in multi-place cockpits. Coordinated crews cut the odds of being a statistic! ■

NOMEX vs NYLON Flying Jackets

By **MAJOR WILLIAM HARRISON**
Life Support System Manager
Kelly AFB, TX

■ How many times have you heard other aircrew members refer to flying as hours and hours of boredom interrupted by fleeting moments of stark terror? I don't believe there is a crewmember anywhere who can't recall a few of these extremely tense moments. One of those heart-pounding sessions, which occurred a short time ago, should make everyone who flies evaluate how much his own skin is worth. Let's take a look at some of the highlights of this mishap and see just what occurred.

The scene: A fighter base in the southern part of the United States. The machine is a two-seat fighter aircraft with both crewmembers strapped to their seats, preparing to hurl themselves into the blue in search of fame, fortune and to fill a few of the required squares. The front seat pilot depressed the ignition button on the throttle and the starter began its whine. Shortly after reaching 75 percent engine rpm, the crew heard a muffled explosion. Hearing that, the pilot attempted to retard the throttle but it would not go into the cutoff position. Upon seeing flames on the left side of the cockpit, he abandoned further attempts to shut down the engine. As flames shot up both sides of the open cockpit, both front and rear seat pilots decided that things were getting too hot for their liking and thus prepared to depart the scene . . . rapidly.

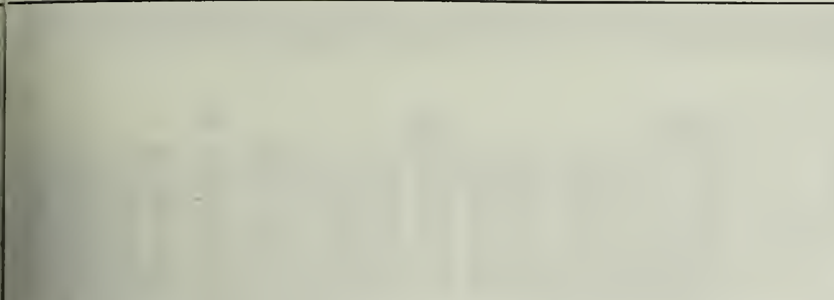
The front seat pilot then released the lap belt and shoulder harness, stood up in the cockpit, stepped onto the right canopy rail, and jumped to the ground. The rear seat pilot, not wanting to be left holding the bag, or in this case the burning airplane, closely followed suit. Both rolled on the ground thinking their clothes to be on fire, and then were escorted to the ambulance by the crew chiefs. The fire was extremely intense and the aircraft was destroyed.

The front seat pilot was wearing a nylon flying jacket of which the outer portion of the left sleeve was burned completely away from the shoulder to the cuff and he received third degree burns of both wrists. The rear seat pilot was wearing a nomex flying jacket and thus was protected from upper torso burn injuries.

In placing the two jackets sid side, it is obvious that all aircre should heed the aircraft Mishap Investigation Board's recommendation that, "all aircr be outfitted with nomex flight ja as soon as possible."

Now comes the hard part – ge the jocks to turn in their trusty veteran nylon jackets for the ne kid-on-the-block "nomex." I c hear it now, "I can't part with r nylon jacket, it saw me through tough spots in pilot training and 100 missions in Southeast Asia, still has a lot of life left in it. G the nomex to the new guys, I'm keeping my tried and true model

Many of us have scores of "v stories" that we can recall just b looking at our old trusty jackets; scuff mark on the shoulder or a



n on the sleeve. These battle scars visible proof of where we have n and what we have done, and it nderstandable that there is some ctance to part with this old nd. But let's not let past nories prevent us from taking antage of the latest in protective hing.

n recent years, we have seen the oduction of nomex flight suits, ves, insulated underwear, G-suits, preserver packs, and seat cushion ers. The nomex jackets, both ter and summer, are the latest in aircrew fire protection. Check out your flying wardrobe and, if you're still wearing a nylon jacket, how about getting your order in for the nomex and retiring the nylon? ■

REUNION

World War II, 315th Troop Carrier Group Association, 3rd Unit reunion October 23, 24, and 25, 1980, St. Charles Hotel, New Orleans, Louisiana 70140. For additional information contact: Ed Papp, 315th T.C. Gp., Ross Llewellyn, Incorporated, 222 S. Riverside Plaza, Chicago, Illinois 60606.

t wearing nylon jacket received serious burns. Other pilot, wearing nomex jacket, was uninjured.

Crew Confusion

Helicopter Mishap With a Moral

■ When the rpm warning light and audio activated as the UH-1H was making a ground controlled approach to the airfield, the pilot lowered the collective and began a left turn towards a forced landing area. The aircraft approached the ground in a nose-high attitude with about 20 knots of forward airspeed. After a hard touchdown, collective was increased. The Huey became airborne again and pitched forward. The main rotor blades hit the ground with enough force to cause the transmission to be displaced.

The mission was to fly to a post about 55 minutes away, pick up passengers, and return to home base. While the pilot planned the flight, the copilot preflighted the aircraft. A fuel sample was not taken, and the aircraft was overdue an engine runup and daily inspection.

Although required by current directives, there was no premission coordination between the crewmembers concerning duties in the event of an emergency.

The first leg of the mission was flown as planned and, except for a slight fluctuation in egt, aircraft performance was satisfactory. The copilot, allegedly to reduce fuel consumption, decreased engine rpm to about 6400-6500.

The Huey was refueled at the passenger pickup point. The return flight was delayed more than 2 hours awaiting arrival of the passengers. Departure was made without a passenger briefing.

A VFR flight plan was filed. Weather at destination was 800 feet overcast with 10 miles visibility. Fourteen miles east of destination, a ground controlled approach was requested. The aircraft was 10 miles out in level flight at 4,000 feet when the pilot took the controls and began instrument flight. The ground controlled approach was initiated, and the aircraft entered a layer of clouds at 1,800 feet. At this point, a prelanding check was made, and the landing light was extended but not turned on.

As the aircraft cleared the bottom of the cloud layer, the rpm warning system activated. N_2 rpm and rotor rpm dropped to 6000 and 300 (needles joined). The pilot lowered the collective without rolling the throttle off and began a left turn toward a forced landing area. The pilot then made a Mayday call and decided to try to increase engine rpm using the increase/decrease switch. Simultaneously, the copilot moved the fuel control governor switch to the emergency position. The resulting engine overspeed was in excess of 7000 rpm, and the rotor overspeed was in excess of 400 rpm.

The aircraft responded with an immediate nose-up attitude and right yaw. The pilot increased collective pitch and retarded the throttle to decrease engine and rotor rpm. Without waiting for acknowledgement from the pilot copilot returned the governor sw to the automatic position. Engin rotor rpm decreased and was stabilized at 6000 rpm and 300 r with the collective full down anc throttle full on.

About 300 to 400 feet above t ground, airspeed was 40 knots a decreasing. The pilot lowered th nose of the aircraft and the airsp stabilized at 40 knots. About 20 30 feet above the ground, the pi decelerated but did not apply po until ground contact was made. aircraft approached the ground i nose-high attitude with about 20 knots of forward airspeed. Touchdown was hard. Collective increased, and the aircraft becan airborne again, then pitched forv The main rotor blades hit the gr three times, and the transmission displaced. The aircraft came to r in an upright position.

The 28-year-old pilot had alm 800 rotary wing flight hours. Mo than 700 of these were in UH-1I The 22-year-old copilot had alm 300 rotary wing flight hours, wi more than 200 in UH-1Hs.

The performance of both aviat

; satisfactory during their
taccident flight evaluations.
wever, both aviators displayed
ıknesses in the knowledge of . . .
ergency procedures, use of the . . .
cklist, and the performance of
ɔrotations. Neither aviator knew
correct procedure for manual
ration of the throttle with the
ernor switch. . . .
he pilot permitted the copilot to
p N_2 down to considerably less
n 6600, allegedly to conserve
l. The aircraft had been refueled
ore start of the return leg of the
sion and estimated time en route
; one hour. The need for fuel/
ge management was irrelevant to
e accomplishment of the mission.
urther beep-down of N_2 may have
dvertently occurred later in the
ht, causing the rpm warning
tem to activate. There was no
dence to confirm a materiel
function.
ın approach with lower power
; made because the pilot and
ilot incorrectly assessed a low
ine/rotor rpm indication as a low-
e governor failure and failed to
ɔond to the suspected emergency
ectly. Following the onset of the
ergency, the pilot began to
edy the condition by beeping up
The copilot placed the governor switch in the emergency position while the throttle was in the full-on position without telling the pilot. When the pilot tried to compensate for the resulting engine/rotor overspeed by adding collective and rolling off the throttle, the copilot returned the governor switch to the automatic position, causing further confusion.

The cumulative effect of these actions may have overloaded the pilot to such a degree that he was unable to complete the approach and landing without damaging the aircraft. The pilot initiated the deceleration phase of the approach at too low an altitude (about 25 feet agl) to fully realize an appreciable reduction in forward speed and sink rate before touchdown was imminent. As a result, he was late in applying control inputs necessary to arrest the rate of descent and achieve a near-level attitude on landing.

Although the copilot cannot be faulted for misinterpreting a probable beeped down N_2 condition as a low-side governor failure, he should not have cycled the governor switch into and out of the emergency position without the pilot's knowledge. The pilot did not brief the copilot before the flight regarding duties and responsibilities in the event of an emergency. Also, when the pilot began to remedy what he thought was a beeped down N_2 condition, he did not coordinate his actions with the copilot.

- No fuel samples were taken during the mission.
- The pilot did not brief crewmembers concerning duties in case of an emergency.
- Passenger briefings were not given.
- The aircraft was started and shut down without use of the checklist.

The commander had an excellent training program in writing; however, it was not being enforced. Training in the use of appropriate publications, weather, emergency procedures, and other flight-related subjects was not provided on a regular basis.

Stress and its relationship to crewmember performance, as well as the types of errors that lead to creation of a high stress situation, should be discussed at unit safety meetings.

Commanders must ensure assigned personnel are ready to perform jobs assigned. Less experienced aviators must be continually monitored, evaluated, and trained as necessary to ensure they are capable of coping with in-flight emergencies. Aviator judgment should be evaluated as an area of special interest during standardization evaluations and unit training flights.

Commanders should emphasize to their aviators the importance of crewmember briefings prior to flight, proper crew coordination, and aviator professionalism in general. — Adapted from *Flightfax*. ■


FIRST LIEUTENANT

Ben G. Brockman

FIRST LIEUTENANT

Berneil L. Reed

401st Tactical Fighter Wing

■ On 10 September 1979, Lieutenants Brockman, AC, and Reed, WSO, departed Torrejon AB, Spain, in an F-4D as part of a Squadron deployment to Incirlik CDI, Turkey. Immediately after gear and flaps were retracted, and prior to terminating afterburner operation, both engine fire lights and both overheat lights illuminated. The city of Torrejon de Ardoz and numerous high-rise apartments are located only one mile from the departure end of the runway. Lieutenant Brockman and Lieutenant Reed realized that if they jettisoned the external stores, the fully loaded fuel tanks would impact into Torrejon de Ardoz's most heavily populated area. They thus began a shallow climbing turn away from the apartment complexes and terminated afterburners. At this time, both fire lights and the right overheat light went out. Lieutenant Brockman then retarded the left throttle to idle since the left overheat light remained on. The fire warning circuits tested good at this point and the EGT on both engines was normal. By this time, they were over the less heavily populated area between Torrejon AB and Madrid-Barajas International Airport (located some five miles west of Torrejon de Ardoz) and were establishing themselves on a right downwind for a VFR straight-in. As they informed the tower and supervisor of flying of their problem, Lieutenant Brockman deselected the external tanks, went to stop transfer, and began dumping fuel in anticipation of a heavyweight landing. In the space of only a few minutes from the onset of the emergency, the crew had completed all checklist items and were on an extended VFR straight-in approach. Lieutenant Brockman terminated the emergency with an excellent heavyweight landing and shut down the aircraft at the end of the runway. Investigation revealed that the centerline tank had partially broken loose from its fittings. Additionally, extensive fire damage was evident throughout the aft portion of the aircraft. The outstanding airmanship, professional abilities and calm thinking demonstrated by Lieutenants Brockman and Reed during this emergency marked the difference between tragedy in the heavily populated suburbs of Madrid and the actual safe recovery back at Torrejon. WELL DONE! ■

☆U.S. Government Printing Office: 1980—683-214/9

STATES AIR FORCE

Well Done Award

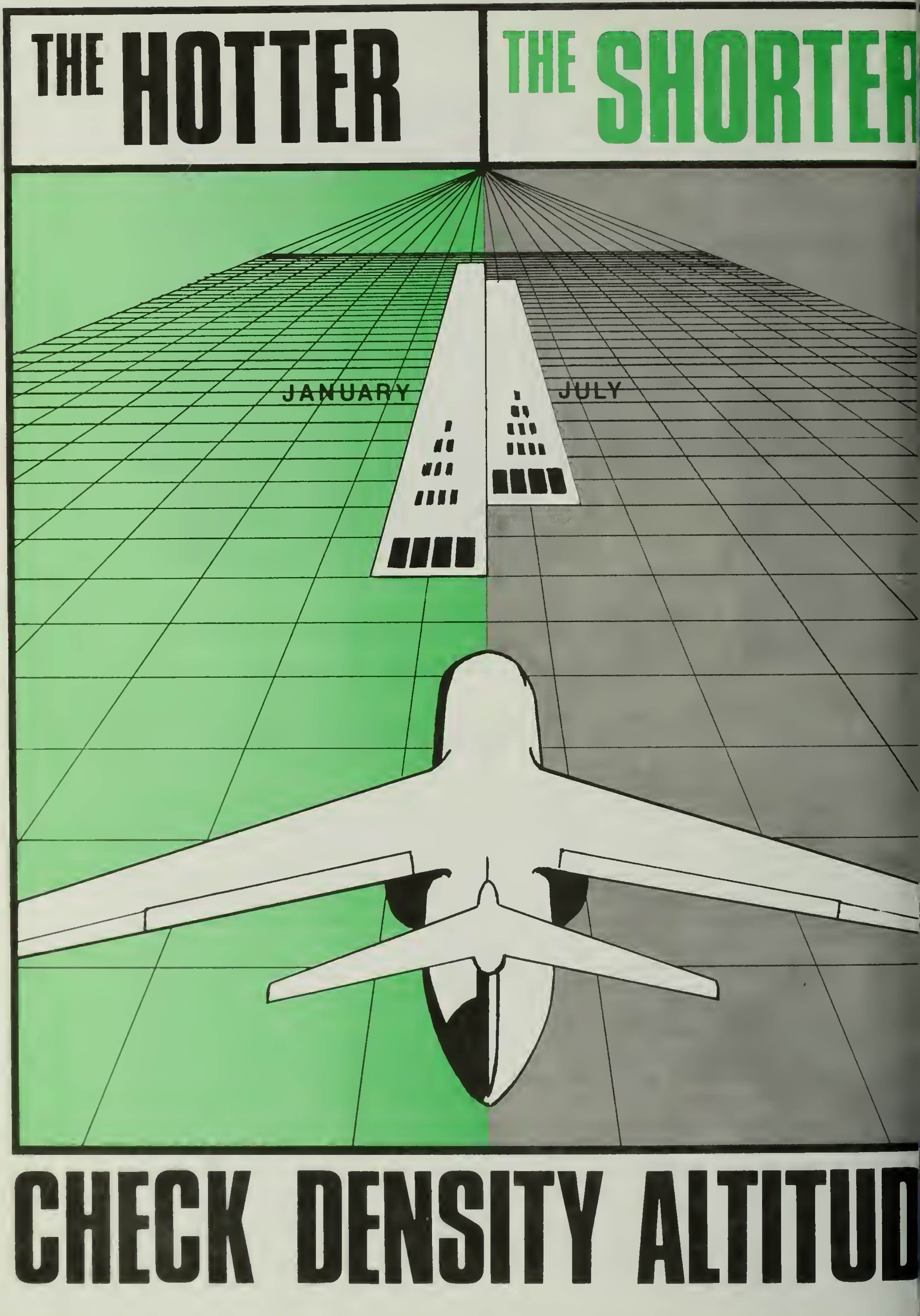
resented for nding airmanship l professional ormance during ardous situation and for a cant contribution to the States Air Force ident Prevention Program.

CAPTAIN

Brent Leveille

22d Bombardment Wing
March Air Force Base, California

■ On 28 August 1979 Captain Leveille was flying the low level portion of a B-52D training sortie at night below an overcast when the aircraft developed multiple AC power failures. Dash 1 procedures to restore power were implemented immediately, and the pilot initiated a climbing right turn to abort the low level route. During the climbout, the aircraft experienced total AC power failure limiting the pilot's instrumentation to "needle, ball, and airspeed." While the aircraft was in the overcast, the airspeed indicator failed to zero. Still in the weather, the aircraft entered a 3,000 - 4,000 fpm rate of descent before the wings could be leveled using needle and ball indications. A gradual climb was re-established. Soon afterwards, AC power was restored allowing the pitot heat and airspeed indicators to function normally. The aircraft was recovered without further incident. The professional performance of Captain Leveille and crew under the most demanding conditions was responsible for saving a valuable aircraft. WELL DONE! ■


THE HOTTER
THE SHORTE
JANUARY
JULY
CHECK DENSITY ALTITUD

AEROSPACE

FETY • MAGAZINE FOR AIRCREWS
AUGUST 1980

IN THIS ISSUE

Near Disaster

A Boot Full of Rudder

Visual Illusions

This Thing Called DENSITY ALTITUDE

■ What really is this thing called density altitude? It obviously has something to do with air density or mass per unit volume. To be specific, density altitude is altitude corrected for changes in temperature, pressure, and humidity. Air density will be decreased by a rise in temperature, a drop in pressure, or an increase in humidity. This last effect is due to the fact that while water is obviously more dense than air, water vapor is a gas which is less dense than air. A mixture of dry air and water vapor is therefore less dense than an equal amount of dry air.

These effects can be appreciated by considering an aircraft equipped with a barometric altimeter attempting to maintain a constant absolute altitude over flat terrain. Should the aircraft fly into a low pressure area, or into colder air, or into drier air, a decrease in absolute altitude will result even though the altimeter indicates no change. The remedy here is a simple one involving no more than up-to-date altimeter settings.

The effect of nonstandard density on aircraft performance is a little more complicated. Since density enters into the calculation of airfoil lift, it follows that a decrease in density will result in a decrease in lift produced. The exact amount varies with atmospheric conditions and type of aircraft, but, as an example, the difference between flying in humid rather than dry air equates to a degradation of engine performance of a few percent.

There is also a direct effect on engine performance. Less dense air reduces the pressure ratios through an engine, resulting in a loss of power. In a turbine engine, this loss is about 3 to 4 percent, while in a reciprocating engine, the loss can be as much as 12 percent.

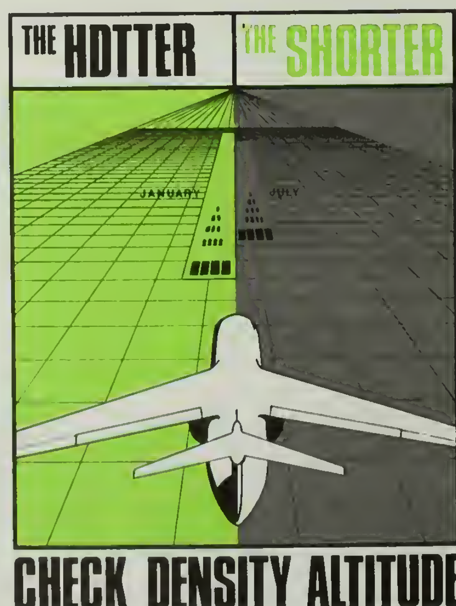
Once the problem is thoroughly recognized, corrective action can be taken. During mission planning, the effects of nonstandard pressure and temperature can be taken into account while using the performance charts as indicated earlier. The effect of humidity is harder to measure.

As the temperature of air increases, so does its ability to hold moisture, and thus it becomes less dense. Density altitudes obtained from sources such as Air Force weather stations include the effects of humidity. The standard density altitude formula, the dead reckoning computer, and most density altitude charts are based on dry air. If the air is hot and the relative humidity high, the error can be 1,000 fee more.

The steps to take then are:

- Check weight and balance.
- Use performance charts to determine mission allowable gr weight.
- Make an approximate corre for humidity. If the air is cold a dry, the correction is negligible is hot and humid, add 1,000 fe reduce allowable gross weight b 200 pounds, or reduce maximur torque available by 1 psi).
- Repeat above steps for eac point of intended landing (or hovering).
- If the result is marginal, re the load still further since the c are inaccurate, and other param have not been considered, such load factor due to angle of bank deceleration, engine condition, winds, and nonstandard lapse r

Sound by-the-book planning results in power margin, and po margin keeps you in the air— summertime or any time.— Ada from *Flightfax,* Vol. 8, No 36, Jun 80. ■



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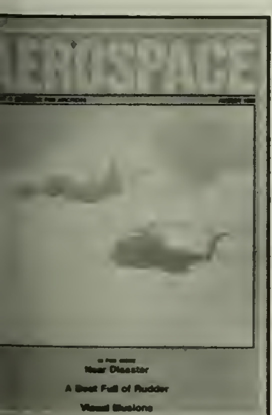

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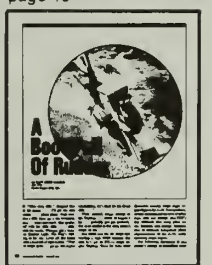

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Near Disaster

In May of this year the National Transportation Safety Board issued a report on an incident in which a B-727-25 came within 375 feet of disaster. The aircraft, with 71 passengers and six crewmembers, was approaching Hartsfield Atlanta International Airport when it flew into a heavy rainshower with vertical and horizontal windshears. The report contains important information for airfield managers and aircrews, particularly those of transport aircraft. Following is an abbreviated version of the NTSB report.

■ Flight 693, a regularly scheduled passenger flight, was en route to Atlanta from Indianapolis, Indiana, with 71 passengers and six crewmembers on board. According to the flightcrew, the en route portion of the trip was routine, and as the flight approached Atlanta, it was cleared to descend and vectored into position for an instrument landing system (ILS) approach to runway 2 The first officer was flying the aircraft.

According to the flightcrew, they had received A matic Terminal Information Service (ATIS) informa MIKE which stated in part, "Atlanta weather, t thousand five hundred scattered, estimated ceiling three thousand broken, three zero thousand broken, bility eight (miles), temperature eight-nine, wind three zero degrees at seven (knots), altimeter three zero zero. ILS approaches runway 26. ILS approa runway 27L. Simultaneous ILS approaches in prog . . . Advise on initial contact you have informa MIKE." The flightcrew did not inform the contr that they had received ATIS information MIKE.

As Flight 693 approached the Atlanta area, the fli crew said that they observed thunderstorms in the vic of the airport both visually and on the aircraft wea radar, and they monitored the storms during the desc According to the pilots, the storms were "scatter and were located to the north and to the south of

roach course to runway 27L. The captain said that e was one cell south of the approach course and e cells, aligned on a north-south axis, to the north he approach course. The southernmost cell of the e northern cells appeared to be located on the ap-ch course to runway 26, which is 5,500 ft north of vay 27L.

he captain said that he placed his radar set in the our mode to examine the cells while the flight was und to the outer marker of the ILS approach to run- 27L. However, he could not recall what he saw in t detail. He said that he was not concerned with three "little cells" to the north which resembled ee little bubbles . . . about the size of eraser heads"; vas more concerned about the cell to the south.

tlanta approach control continued to vector Flight toward the ILS approach course. At 1508:09, the roller cleared the flight to cross Anval—an inter-ion located 3.5 nmi east of the OM and 8.5 nmi of the threshold of runway 27L—at 3,500 ft, to ntain 170 kns indicated airspeed (KIAS) to the OM, and to contact the tower. At 1510, Flight 693 reported over Anval. The local controller cleared the flight to land on runway 27L and added, "the winds are calm and keep your speed up as long as feasible on final, sir. You'll break out of that rainshower in about 3 miles, and there is rain down the middle of runway 27 left right now." Flight 693 acknowledged receipt of the transmission. The local controller said that the rainfall was of moderate intensity.

According to the captain, he monitored the communications between the local controller and the two flights which were ahead of his aircraft on the approach—Delta Airline's Flight 1154, a Lockheed 1011, and Delta Flight 452, a Boeing 727. At 1509:24, the local controller cleared Flight 452 to follow Flight 1154 for landing and informed the flight that there was a shower on the "approach end of runway two seven left." At 1509:54, Flight 1154 told the local controller that it was "clearing" the runway "in that shower that's (un-

Near Disaster continued

intelligible) end of the runway now.''

Flight 693 intercepted the glide slope outside of the OM at 3,500 ft. The first officer said that he used his fuel flow meters to establish the desired thrust settings for the descent, and accordingly, established a fuel flow of about 3,500 to 3,800 pounds per hour (pph) on each engine. Except for minor adjustments to keep the aircraft on the desired descent path, he said he maintained those thrust settings until the aircraft encountered the intense rainshower. According to the engine manufacturer 3,500 pph fuel flow would produce 4,650 lbs thrust at 2,000 ft and 4,580 lbs thrust at 1,000 ft.

The aircraft was placed in the landing configuration at the OM and the final landing checklist was completed before the heavy rainshower and wind shear were encountered. The landing flap setting was 30°; and the computed missed approach or go-around engine pressure ratio (EPR) setting was 1.93. The reference speed for the final approach was 120 KIAS; however, the first officer said that he attempted to hold 135 KIAS after passing the OM. He also said that he kept about a 2° to 3° nose up pitch attitude to stay on the ILS glide slope, and that after leaving the OM, the rate of descent was about 500 to 700 fpm.

The flightcrew said that the ground was in sight as the aircraft overflew the OM. The aircraft was flying in light rain, light turbulence, and experiencing ''a little bit of airspeed fluctuation.'' At 1,000 ft agl, the rain and turbulence increased. The crew said that the turbulence became ''moderate'' and remained at that level until the aircraft flew out of the precipitation. The rain became ''heavy'' and, according to the flight engineer, it was heavy enough to increase the noise level within the cockpit. Ground visibility was lost and was not regained until after the aircraft flew out of the area of precipitation. The flight engineer said that the aircraft reentered a cloud layer as the rain and turbulence increased; however, the pilots were unable to confirm this, because of the amount of rain on the windscreens.

About 1,000 ft agl and simultaneous with the increased levels of rain and turbulence, the indicated airspeed began to fluctuate. The first officer said it decreased from about 135 KIAS to about 120 KIAS, increased to about 140 KIAS, and then, a few seconds later, decreased to between 108 and 110 KIAS. When the airspeed began to decrease, the first officer i that the rate of descent had increased to 1,000 fpm, 800 ft agl, he rotated the aircraft to a 10° noseup attitude, advanced the thrust levers, and called takeoff power. The captain then refined the thrust ting to the missed approach or takeoff power setting

According to the first officer, the pitch correction added thrust had no effect. The descent rate incr to 1,500 fpm and then to 2,000 fpm. The first o then rotated the aircraft to a 15° noseup pitch att and advanced the thrust levers to their forward sto obtain whatever thrust that was ''available at time.'' The captain again ensured that the thrust l were against their forward stops.

At 500 to 600 ft agl, and at an airspeed of bet 105 KIAS and 110 KIAS the stall warning syst stickshaker activated. Almost simultaneous with s shaker activation, the ground proximity warning tem (GPWS) activated; the below glidepath light i inated; and the audio ''pull-up'' and whooper war began. The captain said that the stickshaker and G warnings continued to operate until the descent rate arrested and recovery began. He estimated that the warning system operated for about 10 to 20 sec.

When the stickshaker activated, the first officer that he reduced the aircraft's noseup pitch angle 15° to about 12° noseup and that the stickshaker sto shortly thereafter. However, the captain said tha believed the first officer ''overreacted'' to the s shaker when he lowered the nose. He told the first cer to pull the nose up when the pitch angle rea ''about ten to twelve degrees.'' The first officer mated that the stall warning operated about 5 to 10 At this point, the flight engineer said that the in taneous vertical velocity indicator (IVSI) depict 2,100 to 2,200 fpm rate of descent.

According to the flightcrew, the aircraft flew o the precipitation at 375 ft agl in a right wingdown tude and began to accelerate. The descent was ar and a climbout was begun. The landing gear and were raised during the climb, and the aircraft accele to 200 KIAS.

The flight engineer said that the thrust levers against their forward stops for about 30 to 35 sec. N_1 compressor rpm's and exhaust gas EGT of all

gines had exceeded their limits and were operating ithin the red bands on their respective gages. The ghest readings were noted on the No. 3 engine. However, the engines operated satisfactorily during the)- to 35-sec overboost period and for the remaining 50 in of flight.

At 1512:44, the local controller told the flight that e tower had received a "low altitude alert, check your titude," and then asked if the crew had the airport in ght. At 1512:52, the captain answered, " . . . No sir, e kinda missed out here." At this time, the aircraft as climbing and was accelerating away from the all regime. The captain then told the local controller There's quite a bit of rain . . . a wind shear out there. don't see how anybody could make an approach to the ft one," (runway 27L).

At the captain's request, approach control then vec-red Flight 693 to a clear area south of the airport to old until the weather cleared. At 1542, landing affic at the airport was switched to the east, an ap-oach clearance to runway 9R was offered and ac-pted, and the aircraft was landed on runway 9R with-it further incident.

> There were numerous thunderstorms in the Atlanta area and at 1454 the surface observation for the airport was estimated ceiling 3,000 ft overcast, visibility 4 statute miles, thunderstorms, light rainshowers, temperature 79°F, wind 360° at 04 kts gusting to 32, altimeter 30.01, thunderstorm began 1450 overhead moving northeast, rain began 1433, lightning cloud to ground northeast.

Air Force crews still occasionally expect the air traf-c controller to keep them out of violent weather. That not always possible and our crews should know it. ccording to the report, the WSR-57 S-band weather dar is not capable of measuring air motion within a ell. Furthermore, ATC controllers "indicated that these splays were of little value for furnishing information a pilot about the storm's intensity or its distance id direction from an aircraft."

Although a Low Level Wind Shear Alert System was service at the airport, and was capable of detecting irface level wind shears within the airport boundary, had little or no capability to detect wind shear aloft or outside the airport's boundaries.

Among the board's 10 conclusions were these:

- The Low Level Wind Shear Alert System's wind sensors on the airport did not detect the wind shear condition. The remote weather radar displays at Atlanta and the WSR-57 radar at Athens did not have the capability to measure the motion of the air within the cells. Therefore, the wind shear condition was not detected until Flight 693 traversed the area.
- The flightcrew was unable to assess the intensity of the rainshower and its associated wind shear before they entered it.
- The flightcrew maneuvered the aircraft in accordance with the procedures contained in the company's wind shear training program.
- The wind shear training program conducted by the company, in accordance with the FAA training requirements, contributed to the ability of the flightcrew to maneuver their aircraft through the shear area successfully.

The last three are included here because they emphasize the value of effective procedures and training in the application of those procedures.

The board determined the probable cause of this incident to be the unavailability to the flightcrew of timely information concerning a rapidly changing weather environment along the instrument landing system final approach course. The unavailability of this data resulted in an inadvertent encounter with a localized but heavy rainshower with associated wind shears which contained changes in the horizontal and vertical wind velocities which required the flightcrew to use extreme recovery procedures to avoid an accident. Contributing to this incident was the lack of equipment for the airport terminal area that could have detected, monitored, and provided quantitative measurements of wind shear both above and outside the airport's boundaries. ■

Caffeine 80's

Drug Of Abuse In The Eighties

. . . Interest in preparing an extract of coffee was initiated in 1838 when Congress substituted coffee for rum in the rations of soldiers and sailors. Thus the beginnings of instant coffee . . .

■ For quite some time now during AFR 50-27 Aerospace Physiology Refresher training, students have responded to lectures relating to drugs and "self-imposed stress" with the question: What about caffeine?

Subsequently, we embarked upon a two-phase study to review available scientific information in relation to the toxicology, and physiology of the drug caffeine, and to determine the actual caffeine practices of our students by means of an objective questionnaire. The results of this survey will pro the readers an opportunity to amine their practices in relatio our sample population of airc members.

We found that about eighty cent consumed coffee in s form with about 26 percent at 3-4 cup per day level, 17 percer 5-6 cups per day and about 8 cent at over seven cups per The majority consumed regular fee brewed at average strer sweetened with sugar. Only 7 cent were regular saccharin us

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ospace Physiology
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oks AFB, TX

toons by MR. AL YOUNG
1 Graphics Art Section

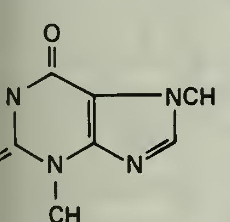
less than 2 percent used cycla-
es.

ike our crewmembers, many ple regard caffeine as a safe, al stimulant without great re- d for the quantity of their con- nption. While the caffeine- ded beverages, food and drugs y ingest are an expensive part their lifestyles, most of the sers'' have paid little attention their daily dose, or the degree their (addiction) involvement. re is no need to be sanctimon- s, or presumptuous about the sible hazard of using too much feine. Moderation has always n regarded as an important rule all practices.

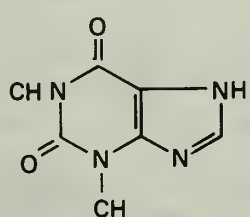
Aodern biochemists identify *nthines* as a family of compounds nprising man's oldest stimulants. Vhen extracted in pure form, caf- ne, a member of the Xanthine nily, is a shiny white powder. s weak base alkaloid is closely ated biochemically to morphine, otine, cocaine, purines, and chnine. The structural formula:

$$C_8 H_{10} N_4 O_2$$

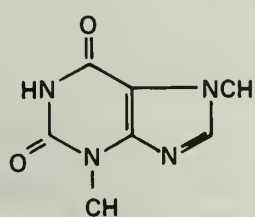
h minor arrangement of the methyl ups, accounts for the three prin- al forms of methylated xanthines caffeine shown below:



Coffee
Molecular
Weight: 194.19



Tea



Cocoa
(Lesser effect
on CNS)

Of these forms, caffeine, and its ost prevalent source, coffee, is popular throughout the world.

The Physiology of Caffeine

CAFFEINE This drug is described as non-adaptive (regular use does not diminish its stimulating effects). It is not physically addicting *in the sense that withdrawal will harm,* or produce violent symptoms. It does seem to be psychologically addicting, and not easily discontinued. Some tolerance is evident in that it takes more to get the same effect with continued use. Humans tend to increase its use with age.* Many use it to keep their weight down.

A POWERFUL CNS STIMULANT Here are Key Descriptive Characteristics:

Antidepressant

Stimulant, analeptic

Maintains wakefulness (antihypnoid)

Affects muscles by central affect (theobromine [cocoa] has greatest affect on isolated skeletal muscle)

Causes increased peripheral blood flow by vasodilation and *decreased cerebral blood flow* (cranial vasoconstrictor, and reduction in cerebrospinal pressure).

Does not significantly affect objectively measured intellectual performance.

Does affect speed of accomplishment of motor tasks significantly, up to an individual dose level.

Tolerance is slow to develop, and slow to disappear (may require more than two months of abstinence).

Exactly how caffeine works is largely unknown, but one theory holds that it inhibits phosphodiesterase with a resultant increase in tissue 3'-5' AMP. 3'-5' AMP is an intracellular intermediate which increases the rate of hormonal reactions. While the mechanism is not entirely clear, it also plays a role in the vigor of muscular contraction by affecting the release of calcium from intracellular stores.

HOW CAN YOU TELL IF YOU'RE REALLY HOOKED?

If you find this article with coffee stains on the first page untidily stashed in the trash can, it may mean that you or the reader, undesirable of being objective about coffee, is *really* hooked. There is also a strong possibility that the individual also smokes, consumes alcohol regularly, and finally, is not a small percentage of the population!

*By one survey, American coffee consumption at over 7 cups/day is higher in 40-49 year olds.

Caffeine 80's
Drug Of Abuse In The Eighties? continued

But that individual is not you; you are still reading! You are a rational, objective person willing to appraise your own caffeine consumption practices. The next step will be considerably tougher however. It should *not* be attempted when you face a situation that demands your top performance (i.e., before a long drive at night on the highways or similar flight in the airways).

If you consume five cups (or more) of coffee every day (or equivalent), are blessed by a vacation-like pause in your routine (no great demands on your performance), try absolute abstinence from caffeine. This means no coffee, coke, tea, APC's, cold pills, chocolate, or foods containing caffeine, for at least 24 hours. After this time of abstinence, subjectively note your symptoms, and set out for another caffeine-free 24-hour period. It will take about seven days of this to "clear" the caffeine from your system. The drug withdrawal symptoms are not widely known because very few people have tried the experiment, and fewer yet have completed it! If you find that you can go long periods without caffeine, you were probably not physiologically addicted. One word of caution, however, when withdrawing from caffeine count your calories because you may tend to put on weight!

After 12-18 hours you may note headache (widely reported) and a general restlessness, disquiet, anguish, or even aching pains. Dysphoria describes the variable human response to caffeine withdrawal.

Some will complete the withdrawal with very little ill-effect, but they are of the minority in belonging to a group who partake of caffeine only on an occasional basis. (Their total previous caffeine consumption during 24 hours has probably averaged less than about 100mg, or the equivalent of one cup of coffee).

If you regularly suffer from any of the following symptoms, you have even greater cause to evaluate your caffeine intake practices: (All of the following symptoms have been attributed to regular consumption of large doses of caffeine):

- *Insomnia
- Sense of dread, depression
- *Anxiety
- *Fatigue
- *Loss of balance
- *Faulty thinking
- Finger tremor
- *Increased reaction time

(Those marked with an asterisk are more directly related to safety.)

In Terms of Performance T day, or Longevity Tomorro How Much is too Much?

For Americans in general, the ra order for contributing caffeine their systems are coffee, tea, a colas. The drug is routinely remov during the processing of all coff The greatest to the least amount caffeine among the various for of coffee can be listed as follows:

Regular
Instant
Decaffeinated Regular
Decaffeinated Instant

Ironically, the caffeine that pe plė pay to have removed from th coffee is purchased by themselv or others in drugs that have c feine added, since decaffeinati provides a major source of caffei for the chemical and drug indu tries. It is also made synthetically.

The approximate values of c feine per average size cup (6 oz) a

HOW MUCH IS TOO MUCH?

Coffee	100 mg/cup*	*For 6 oz cup. (It is realized that some variations will occur in relation to strength of brew.)
Instant Coffee	60 mg/cup	
Decaffeinated	3 mg/cup	
Tea (Theophylline)		75 mg/6 oz cup
Instant Tea		30 mg/cup
Cocoa		6-40 mg caffeine 200 mg theobromine
Cola		60 mg/cup
n regular coffee the method of preparation causes considerable variation n strength:		
Automatic	15 mg/cup	In general, caffeine content relates to the highest grind or the smallest leaf parts (tea).
Dripolator	142 mg/cup	
Electric perk	104 mg/cup	

though probably benign when in low dose levels, there is in-ing interest that caffeine in ac-ilated high ingestion levels may elated to a variety of acute and nic nervous and physical con-ns. It is also possible that at ively low doses it serves as carcinogenic agent. Because so people ingest caffeine from a ty of sources, and because there also more artificial flavors and s in foods, additional work is ed to more clearly define pos- interactions. Environmental rs involving radiation, air and r pollutants, and industrial bi-ucts, add to the complexity of roblem.

nally, because drugs are used idely, it is important to real-hat there is great interaction be-n the xanthines and other drugs. possible that some of these at dose levels have beneficial ef-. While it could probably be that ideally, in a regime of nat- living, we would live and en-better health without caffeine, possible that since caffeine is tural compound, and because ave most likely adapted to it, ay be that it exerts beneficial physiological effects at low doses.

Since the mid-seventies, there has been increasing interest in caffeine's possible mutagenic effects. At levels of caffeine possible as a result of high content beverage consumption: (or dose equivalent amounts provided to animals in feed or water), caffeine has been studied with regard to possible effects on DNA or the chemical substance of chromosomes.

It may slow the repair of DNA damaged by ultraviolet radiation, or it may affect change of DNA by other carcinogens (cocarcinogenesis). How caffeine might affect repair, or rate of synthesis of DNA is related to the structural similarity of caffeine to adenine and quanine. Both are important building blocks of the DNA molecule. It does not form a stable bond in DNA substitution, but its potential for cocarcinogenic interaction is real.

While little is known of plant caffeine physiology, high doses cause chromosomal breakage in plant cells, microbes, paramecium aurelia and others. Caffeine affects older cells more rapidly than younger. While en vitro culture results cannot be directly attributed to en vivo, it has been observed that humans tend to consume more coffee with advancing age.*

Dose levels are extremely important to these relationships and results are as yet inconclusive. There is reason for concern, however.

How Does the Use of Caffeine Relate to Performance, Safety, and Mental Health?

If individuals become depressed because of work, or other environmental factors, the result may lead to the initial use of caffeine and other drugs. With the present condition of the world, and the uncertain stresses encountered, it is no wonder that the American adult population is about 85 percent involved with caffeine. The degree of the problem, probably as throughout all of toxicology, relates to the dose and the total time of involvement. The average plasma level then, and the length of involvement, would relate to the possible pathology. Because we are constantly bombarded with "take this for pain," take that for indigestion (i.e., Excedrin 65 mg/tab., Antacids 50 mg/tab., Bromo Seltzer 32.5 mg/cap), so that the total daily caffeine intake may increase to the point where it affects performance (safety) and mental health.

Coffee, Smoking and Alcoholing

There are great difficulties in attempting to isolate caffeine as an affector of human physiology (and

*There is a positive correlation for coffee drinking (women more than men) and cancer of the bladder in people over 60. There may be a risk associated with even small amounts of caffeine. This applies to the urinary tract and the prostrate gland

continued on page 19

A Boot Full Of Rudder

By CAPT JIMMY CARTER
356 TFS
Myrtle Beach AFB, SC

■ "Nice shot, lead." Stopped him in his tracks. . . . I'll get the next mover . . . slight bump. Push over aim a little high, got a left crosswind too . . . track-shot-track. Saw sparks-off with the ZSU break . . . back into the weeds. Whoops, got a Master Caution Light. The Hog's pulling to the left. Level off and climb with a boot full of right rudder. "Wart 41 knock it off . . . got my left engine windmilling, let's head for the divert base. . . ."

Well, another single engine in the Warthog . . . seems to happen a lot . . . probably gun gas ingestion. Got to be careful so this thing doesn't depart on me.

Our friend sure has his hands full, working a high threat mission, and now he's got an IFE—a single engine Warthog. There has been much discussion recently about single engine flight in the A-10. Two accid several incidents and the bevy of s sups, dash one changes and FC that followed. But, many pilots not satisfied that enough info tion is available concerning f characteristics of the A-10, w operating single engine.

The following discussion is person's attempt to consolidate

the available information and
er one opinion on the departure
des of the A-10.

First of all, the track record of the 34 engine and the A-10 has been od. But there have been many oc-ions when a pilot has found him- single engine. Let's look at some istics. Of the first 80 reported gle engine incidents:

Fifty resulted in single engine dings.

Of the 14 that flamed-out be-se the aircraft was flown out of envelope, 10 were successfully tarted. Most of these occurred ing early test flight when the en-ope was purposely explored.

Six were listed as possible gun ingestion including the double ine flame-out while testing a dif-ent bullet.

Of the mechanical or mainte-ce related incidents:

Ten were due to fuel control.

Fifteen were due to structural ure and subsequent FOD.

None were attributed to bird kes.

Over 20 were due to some sort oil pressure problem, including six idents of improperly or non-ured oil caps.

Only two incidents involved use the fire T handle, and only one of se was due to fire. The engine has ned on occasion, but shutting off throttle is usually enough to put the fire.

None flamed-out from ice in-tion, although blade damage has curred.

Five happened in the traffic pat-n or while configured for landing.

■ Only two required stores to be jettisoned (9 MK-82 inerts/2 fuel tanks).

From this data some trends can be seen. The TF34 is resistant, in varying degrees, to fire, ice, birds and gas. It needs oil, proper maintenance on the ground, and pilot attention in the air when operating at the outer edge of the envelope.

In addition, if you lose an engine you have close to a fifty-fifty chance of restarting it, depending on the malfunction. More successful restarts could have occurred if the engine had been cooled properly and the caution related to the automatic start systems observed. That is, keeping the throttle out of idle position (e.g., off) so as not to provide fuel and ignition inadvertently to an engine that is overheated.

This is nice to know information if you're sitting around the coffee bar and happen to be discussing the pro's and con's of TF34 reliability with your flight commander. But Wart 42 will need some information about how to get home with a single engine, not why he got one.

Well, he's got over 50 miles to go until he lands. He's got the right throttle at max, and he's climbed to a safe altitude. He disengages the SAS, goes to crossfeed, and pulls the emergency brake handle. While he starts the APU, lead has declared the emergency for him and is getting out the checklist to discuss the options. Wart 42 has things under control, but he's concerned about the possibility of a departure.

While they are busy with the checklist, we'll open the dash one to page 6-11, Side Slip Departure, the only departure mentioned in the dash one.

Below 240 knots you have 25 degrees rudder authority. If you apply all of that, the aircraft yaws the full 25 degrees. You experience light air frame buffet and high lateral acceleration. As advertised, the yaw continues with no more input on your part, and the A/C will rapidly roll in that direction. Attempts to counteract the roll once it is developed have minimal effect until the aircraft is nose low. Neutralize the control and the A-10 is flying again, but you will probably have to recover from a nose low attitude. All this occurs below stall AOA. Above that, the aircraft might spin but more than likely it just stalls and reacts as depicted on page 6-6 of the dash one.

This is not a mysterious aerodynamic phenomenon, nor is it a case of stalling the inboard wing. The secondary effect of rudder or yaw is roll. This is much more pronounced in swept wing aircraft than in a straight wing aircraft like the A-10. Our roll is produced by the slight positive dihedral of the wing when yaw is produced. It becomes a departure because the amount of yaw needed to cause the rapid roll off is uncommanded by the pilot.

So what's this got to do with single engine flight? The two single engine accidents in the A-10 were very similar to each other and were basically side slip departures.

Both aircraft generated a *yaw rate* which allowed the aircraft to overshoot into the region of uncommanded yaw. This yaw overshoot, transient

☞

A Boot Full of Rudder continued

or divergent (or however you label it) is much like the side slip departure described earlier. That is, for whatever aerodynamic reason, the yaw continues, insufficient rudder authority is available to counteract it, and in fact, opposite aileron actually increases the side slip because of adverse yaw.

The important thing for Wart 42 and all of us to remember is that the yaw that was generated in both accidents was the result of pilot inputs.

This is how it could happen. Because of asymmetric thrust and the corresponding drag of a dead engine, the aircraft will seek a certain side slip angle if not corrected for by rudder into the good engine. Asymmetric stores may add or subtract a significant amount to the side slip angle the aircraft will seek, as will the offset nose gear. An increase in angle of attack decreases airspeed and also increases the side slip angle sought.

If you release some or all of the correcting rudder while slightly increasing the AOA, you will generate a yaw rate in the direction of the dead engine.

Your SAS kicks off at this time and adds a yaw transient as mentioned in the note under Yaw SAS on page 1-56. Now the SAS is off, as it should have been, and the aircraft overshoots the side slip angle sought (because yaw dampening is no longer available). The severity of this overshoot will depend on the *yaw rate* generated.

This overshoot puts you into the region of uncommanded yaw and roll. If you have speed brakes open slightly, your roll rate will be increased. If you attempt to roll out with aileron only (no Aileron Rudder Interconnect is available), adverse yaw increases the yaw in the direction you were already going. In addition, the decrease in airspeed has decreased the authority of all your control surfaces. Briefly stated, you have generated enough yaw to do a slow speed rudder roll. But you may not have enough control authority to roll out and you are probably aggravating the yaw with these roll out attempts. All of this occurs well above stall speed.

The side slip departure is real. Early flight tests, two accidents, computer simulations and accident verification flights attest to this. The common denominator seems to be the yaw rate that is generated. Asymmetric thrust, airspeed, AAS, configuration, rudder and SAS inputs can all contribute to an undesirable side slip that would allow the A-10 to roll. Further research is necessary to isolate the specific aerodynamic characteristic of this departure, especially those that may have involved uncommanded input from the SAS.

But for the present time Wart 42 and the rest of us Hog drivers need to refamiliarize ourselves with the basics of single engine flight in an aircraft that does not have center line thrust. As the pilot, you have control over most elements essential to safe single engine flight: Airspeed, AOA, configuration and especially rudder. The description of the departure in this article would be academic if proper rudder were used.

The dash one states that at least half rudder down to stall speed is necessary for coordinated flight with gear down and no flaps. It may take up to 180 pounds of pedal force to achieve full rudder depending on airspeed and how much side slip angle the aircraft is attempting to seek. This may mean engaging the good y channel to give you 10 degrees rudder trim. So regardless of a speed configuration or AOA, cen the ball . . . almost (a slight— proximately 5°—bank into the go engine—ball deflected slightly ward good engine—will result zero side slip. Tape a yaw string a lightning strip to prove this).

Here are some other things you c do:

- Read the dash one (SS-7 is t best discussion available on sing engine flight characteristics).
- Know the checklist procedu cold.
- Single Engine Flight (alrea accomplished by Wart 42).
- Single Engine Restart.
- Single Engine Failure/Fire D ing Takeoff.
- Avoid turns into the dead engi
- Shallow turns, away from t dead engine will take additional ru der to be coordinated.
- Fly the checklist airspeed. (1 kts plus 1 kt per 1,000 lbs abo 30,000 lbs.)
- Remember, your day isn't do once you are on the ground. Be aw of hot brakes.
- Temperature and pressure al tude should be discussed in the flig brief when they would make sa single engine flight critical.
- Use your imagination in di cussing single engine emergencie Use your head when you find you self in single engine flight. U your foot to stay flying. ■

Runway Conflicts

Seems in the past few months
t we have had an unusual number
vehicles on active runways in
nflict with aircraft. The latest
currence had some interesting
ets that indicate just how such
iations can occur.

An aircraft had just cleared the
ive after making an emergency
iding and another aircraft was
ared to takeoff. While it was on
roll, an ops vehicle entered the
iway. The pilot saw it at about
0 kts, was committed and
ntinued takeoff, clearing the
hicle by about 50 feet. The
cumstances were reported as
lows:

The driver thought the runway
is closed because he had seen fire
cks following the emergency
craft. Actually, the fire trucks used an adjacent access road and the runway was never closed. Part of the problem was the ops vehicle was held at a point about 1,000 feet from the access road and 1,500 feet from the runway. At that distance it was difficult to tell which road or runway was used by the emergency vehicles. An illusion can be generated by heat waves, standing water, snow or vegetation making it difficult to accurately perceive the real location of an object 1,000–1,500 feet distant.

When the ops vehicle was cleared to cross one runway, the driver continued on to the active, thinking it was closed.

The driver was not a newbie but a recent graduate of UPT and familiar with airfield environment. His basic mistake was to make an assumption that he did not check out on the radio. A call to the tower would have prevented the incident.

While we're on this subject, several of the individuals involved in occurrences similar to the one related above should have known better. They probably did, but one lapse, a faulty assumption, a garbled radio call not rechecked could have had catastrophic results.

All commanders and safety officers should be aware that a similar incident could happen at their base. One of the things evident in recent occurrences is that it is not just the young, inexperienced airman or a newly hired civilian who makes the mistake but some highly experienced, rated people. Keep that in mind when reviewing your airfield vehicle operations program. ■

OPS topics

Lightning Strikes 3

■ A flight of three F-111s had just entered IMC with no weather on their radars when all three aircraft were struck by lightning. There was a momentary interruption of flight instruments, then all systems returned to normal. Shortly afterward, the flight broke up for separate approaches and one aircraft was hit by lightning again, that time losing all instruments except standby and getting an engine overheat light. Landings from that point were uneventful. The flight was at a level where the temperature was very near freezing. Also a thunderstorm was within five miles.

Timeless Bird

". . . at 500 ft AGL and 480 KIAS, the crew saw a *bird with insufficient time to take evasive action.*" That's what the sentence said, but is that what it meant? Could be. The bird and the left engine of the F-111A collided. Needless to say, the bird got the worst of the encounter; however, damage to the aircraft amounted to more than $45,000. Now if the birds had more time, perhaps they wouldn't hit so many airplanes.

Ear Pains

A C-130 with 30 passengers was climbing after takeoff when the cabin pressurization system was found not to be working correctly. The decision was made to return to base for maintenance. During the descent, the majority of the passengers suffered pain in their ears. In several cases, the pain was described as severe. Two individuals also had sinus pain. After landing, 19 out of 30 passengers requested medical treatment. The flight surgeon examined the 19 passengers and the crew. None of these passengers were familiar with the valsalva maneuver. Eight of the passengers had one or both ears which were "injected" (bright red blood vessel). These same eight people were unable to valsalva due to blockage. Two of the eight reported previous upper respiratory congestion, but the other six reported no previous problems. The flight surgeon advised the eight passengers to discontinue their trip until their ears recovered. After 24 hours the condition of all patients was improved. But five of the eight were scheduled for follow-up exams. The flight crew didn't experience any pain nor did the flight surgeon note any signs of trauma to their ears. Maintenance found a flow control valve stuck open on the cargo compartment air conditioning pack. Not all pax, obviously, are familiar with the valsalva maneuver. Perhaps it would be a good item to include in the pax briefing.

Paratrooper

At 12,500 ft MS loadmasters of a (were accomplishing drop duties. One c loadmasters was wa toward the rear of th craft. Passing the hinge area, the loadr felt that the aircrat celerated and encou some turbulence. two factors plus the that he was walkin ward the rear pro enough momentu

eject him. Assuming fall position, he obs the paratroopers tha just departed his air Keeping his eye on while free falling loadmaster pulled hi cord when the paratro pulled theirs. He la in the DZ unharmed slightly nervous, no d

›lieve It

The report reads like a ıpley "Believe It or ɔt." An F-4 belonging another country was taxi- g after landing when both ewmembers were inad- rtently ejected. The air- aft continued to roll. ıe pilot, after making a fe descent, ran to the oving aircraft and shut ɔwn the engines. All in day's work.

ODDER For F-15

781 Forms seem to be favorite (FODDER) for ıngry jet engines. The est eater was an F-100 gine in an F-15C. The rms were placed in the se wheel well. The pilot parently never looked at em and there they re- ained. Sometime, prob- ly when the gear was wered for landing, the rms found their way into engine. Remember— NLY YOU CAN PRE- ENT FOD!

Volcanic Ash Caused Mishap

Shortly after the Mt. St. Helen's eruption, an Air Force helicopter was sent on a rescue mission to a site near the volcano. As the chopper approached landing, it was suddenly engulfed in a cloud of ash. The pilot slowly lowered collective until the rear skids touched the ground. The landing was fairly firm which caused some damage to the front crossover tube and skid tubes. The loose ash caused a slight skid; otherwise there would have been no damage. The landing was made with no outside visual reference under very trying conditions.

Airport Lighting Change

At all civilian airports effective 1 July, the FAA changed the existing airport lighting criteria. Specifically, the visibility requirement to operate approach lights increased from less than 3 miles to 5 miles or less. Additionally, the ceiling criterion of below 1,000 feet for operation of the sequenced flashing lights (SFL), commonly referred to as strobes, was deleted leaving only the visibility requirement of less than 3 miles. While this criterion will exist at all civilian airports, the Air Force policy to operate SFL when the ceiling is 1,000 feet or less (regardless of the visibility) will remain in effect at all Air Force bases. Pilots still may request that the SFL be turned on or off regardless of ceiling or visibility; however, keep in mind the differences between the civilian and Air Force criteria for operation of the strobe lights.

Whether Weather

Two aircraft were damaged by hail in separate episodes but with a common thread. Each expected Air Traffic Control to pass a warning.

A T-37 got some dents in the leading edge of the wing. The pilot was briefed of isolated T-storms enroute. After descent to 15,000 for penetration, the aircraft entered clouds with no turbulence encountered. After about 45 seconds hail and rain hit the aircraft and continued for 20 seconds. The pilot reported he was not advised by either Center or Approach Control of any heavy weather or hail.

An A-10 was more severely damaged with both intake ducts, vertical stab, strobe lights and nose cone receiving hits. The weather briefing indicated an isolated storm far north of the route that should not be a factor. No weather was forecast at

flight planned altitude. The flight leaped off, the IP assuming that Center would keep him notified of any severe weather. The flight entered an embedded thunderstorm and ran into hail.

All pilots should know, and presumably do, that air traffic controllers have limited capability to identify hazardous weather and are not required to routinely offer weather avoidance assistance. Usually they will, when workload permits, but pilots should ask for the service if they want it. It only takes a few words. That's better than explaining all those dents in the airplane. ■

Air Discipline, Brains, Roe, Mindrolling, And Wallbangers

By MAJOR GARY L. SHOLDERS
Directorate of Aerospace Safety

■ Air discipline – what is it? I've read a lot of words about air discipline violations of late. It seems like every Tom, Dick, and Harry who has ever flown an airplane has his own personal interpretation of the meaning of the term.

What, then, is discipline? It just so happens that I have a little war story that may get this discussion off on the right foot. I was fortunate to have had some expert tutelage in the art of flying fighters. One day I was flying on the wing of one of my teachers when we were about to get wrapped up with a couple of blue bandits in Bannana Valley. I could almost see my leader's fangs hanging out of his mask, as he had the upper hand, and was seconds away from distributing the Bandit all over the countryside.

It was at that very moment that my trusty steed decided to go ape – a screwdriver in an aileron bellcrank caused a few moments of sheer terror as the machine did its best to scrape off the top of a nearby mountain. I punched the mike button and calmly (?) uttered a prearranged code word which meant, "Boss, I gotta go home." There was no discussion; we separated from the impending victory as briefed in a proper military manner. That, guys, is discipline.

To my flight leader, the temptation to continue the engagement for a few more seconds must have been nearly irresistible. Believe me, there were a lot of guys who succumbed to those temptations; oftentimes they didn't come home.

Okay, the war story is over and discipline remains undefined. Here's one way to define it: *A concentrated application of brainpower*. A disciplined fighter jock is and always will be a thinking man. You see, anybody can lean on the bar with 6 G and tell war stories. Almost anybody, with enough practice, can turn his ham fists into gold. Anyone who is smart enough to read simple sentences can remember regulations to the letter. None of these things, singularly or in combination, add up to a real live disciplined fighter pilot. To have discipline, to be one of those guys who is worthy of calling himself a fighter pilot, one must possess the will and the physical faculties to plan for and concentrate on the task at hand.

The two key words in the above dissertation should be easy to recognize: *Planning and concentration*. Let us look at planning first. In the little war story my flight leader was smart enough to look ahead while *on the ground* a some of the problems that could come up. He devised a plan based upon the overall environment that we faced. When a problem reared i ugly head, he was prepared to deal with it.

It should be obvious to the reader that planning can't solve all flying problems ("The best laid plans,"

but it sure gives a jock a
ting chance. Time has a way of
pressing itself during times of
ss—everything that was all
ed up in a tight little ball one
ond seems to scatter itself all
the street in the next. A well
ght out game plan that deals
the possible contingencies
es common sense and is the sure
cator of a well-disciplined
ter pilot.

et's expand on this idea with
her example that may hit a little
er to home for those folks who
er have seen Bannana Valley. In
title of this article you saw
OE'' and ''BRAINS.'' Here's
those two words are there.
gine yourself planning a simple
1 BFM mission. You decide to
ome vertical stern intercepts and
uple of visual perch setups. You
through the ROE and see that
e are several rules that apply
ctly to your mission. Good,
ible rules like: ''Don't go within
0 feet of the defender's altitude
ng intercepts without a tally
'' ''Don't get any closer than
0 feet to the defender's
raft.'' ''Don't go within 2,000
of a cloud.'' These rules are
y standard around the world; it
ldn't be any problem to comply.
wait a minute—instead of just
orizing the rules and letting it
t that, perhaps you should *think*
tle bit. *How* do you plan to
ply?

Suppose you are right in the middle of your first intercept and find yourself nose straight up, 600 knots on the clock, 5,000 feet below the defender, and *no tally*. What now? Well, pardner, you have just broken your first ROE. There is no way that you are going to keep yourself from smartly busting right through the defender's altitude. This very thing has happened about 5 million times; at least four airplanes complete with people have bitten the dust after the ''big sky'' no longer took care of them. A little prior planning would lead you to the conclusion that you'd best run that intercept on the cold side until tally ho. A little more thinking will lead you to a surefire way to keep the thing cooled down and maximize your chances for a tally *at the same time*. I'll leave the method for you to figure out.

What about some of the other ROE? I'd sure like someone to tell me how to do a high deflection, high line of sight rate gun shot in an F-4 without ending up closer than 1,000′ to the defender. Tell me how, while looking at high six, you plan to judge your distance from clouds. I have never been able to do that; 2,000 feet, 2 miles, or 20 feet—it all looks the same to me when somebody's trying to gun me. More than once I've ended up inside of one of those fluffy white things. You know, we could have thirty eleven pages of examples about rules that are more complicated than they seem on the surface—compliance isn't always that easy.

The point to be made here is that the disciplined fighter pilot does one hell of a lot more than stuff sixty-nine thousand rules in his computer bank. He thinks through the flying situations that he is about to face, figures out *why* the rules are there, *how* to comply with them, and *what* to do if he goofs up and ends up in the very situation that the rules try to prevent.

If you have never tried the little planning exercise outlined above, you will be pleasantly surprised at the results. As you sit down and really start *thinking* about airplane driving (possibly for the first time in your life) you'll find that all kinds of great revelations start appearing in your head. All kinds of ''what if?'' type questions come and go. As you answer each question to your own satisfaction, you take one more step toward becoming the perfect fighter pilot. As you practice and refine your game plans while airborne, you can watch yourself enter a learning curve that is steeper than you've ever experienced before. There will come a time in the learning curve when you find that your knowledge of a particular task outstrips the simple guidance contained in the ROE. Rules become common sense; they no longer are things that you commit to memory, but things that are integral to your flying behavior. How's that for a bit of heavy philosophy? Try it, you'll like it.

Now let's talk about *mind-rolling*. As an air-to-air instructor, I learned very early that the average jetjock has great difficulty leaping into a ☞

Air Discipline continued

big, complicated hassle after droning along for 20 minutes under IFR control to get to his working area. It seems that after a great big complicated hassle, the average jock's brain goes TDY. We have all seen about a trillion dumb, dumb, dumb mistakes made right after knocking off a fight or completing some other demanding phase of the mission. Why? Probably because most guys just haven't figured out that fighter flying demands that your gourd be moving along at about a thousand miles an hour (mindrolling). In combat, the transition from ho hum straight and level was easy—all one needed was a tally ho on the Black River or a Bandit call. The throat dried up, and the adrenalin started moving right now. In peacetime it's not that simple—there are few natural inducements for the jock to put his gourd in gear.

You see, thinking fast is integral to the business—constant adjustments to the game plan, quick, correct decisions and rapid recognition of changing situations are characteristic of a good, disciplined fighter pilot. In peacetime, you have to train yourself to get that mind rolling. There are a bunch of devices that you can use to do that. For example, some of us have somehow developed a Pavlov-like response to 100 percent oxygen. Before engine start, I reach down and switch that lever to 100 percent—it's like magic. I know that 100 percent oxygen doesn't do that in itself, but I have conditioned myself to respond to that particular stimulus.

In any case, it's up to you, the jock, to consciously develop a way to start mindrolling. Keep yourself busy all the time, *every time,* from the moment that you lower your Grecian bod into the cockpit until you climb out. You need to consciously fight any tendency to relax anytime that you're in that airplane.

Let me digress for a moment and tell a short story about that. It was a 4 vs 3 DACT flight. We all blasted off and leaped into one of the most satisfying fights that I've ever had the pleasure to be associated with. After 20 minutes airborne, hair on fire, soaked with sweat, feeling good and still mindrolling about a million miles an hour, I pulled off the runway. At that exact moment, my gourd decided to go nite-nite. The upshot of the whole thing is that I left every switch in the cockpit on, owed the crew chief about 40 cases of beer, and was thoroughly disgusted with myself. It is scary to think of the possible consequences of a letdown like that while airborne.

There is just one more subject that we should talk about with respect to air discipline. It's called *wallbanging.* First, another war story. Once, while flying on a MIGCAP mission up north with a brand new guy flying in the number 2 position, we got wrapped up with a bunch of SAMs, MIGs, and I can't remember what all else. The new guy panicked. He started hollering unintelligible stuff over the radio, flying erratically, etc. To make a long story short, he darn near got a couple of guys killed. had to beat feet out of there and couldn't do our mission. There i: just one point to that story—pan (wallbanging) has no place in a fighter pilot's vocabulary.

If you are one of those guys whose heart leaps into his throat whose brain turns into peanut bu every time that you see a fire lig someone is liable to get fatally hurt—you or somebody else someday unless you embark upo active program to stop being a wallbanger. Like mindrolling, a conscious effort is required to de with stress situations. The partic device that worked for me is a variation of the old cavalier attit For example, in combat I just tol myself that I deserved to die if I couldn't dodge that crummy old SAM 2 with my name on it. Aft all, dodging SAMs is part of the description. This same attitude h worked when it comes to fire lig and all that sort of stuff. Like th pilot who never gets lost because doesn't care where he is, you ca never get hurt if you develop a s of mind which allows you to dispassionately analyze and deal with the threats that confront yo

What all of the above boils do to is a simple, single thought: AI DISCIPLINE IS USING YOUR HEAD—ALL THE TIME. ■

Caffeine 80's

Drug Of Abuse In The Eighties?

tinued from page 9

thology), in that smoking and inking habits are covariates—perns indulging in one are more kely to partake of the other. The le of cocarcinogens is biochemically ry complex, and an important role future science will be to deterine inner actions among subances.

It is interesting that only about percent of heavy smokers drink coffee. Among individuals smok- better than a pack a day, about percent drink more than six ps of coffee per day.

There may be an underlying physogical reason for this pattern. It s been noted that coffee-drinking garette smokers take more nicoe into their systems when they gest no caffeine. Also, as meased in saliva and urine, this ineased clearance of caffeine, is en in smokers. This process has en tentatively identified with duction of an enzyme in the liver epatic arylhydrocarbon hydrolase). Since caffeine is a circulay dilator and nicotine a constric-, the pharmacological reciprocal ationship may somewhat mechanally explain one affecting clearce of the other. Both relate to ineased catecholamine production hen taken independently. Also, thdrawal from caffeine or nicoe lowers epinephrine—norephinerine levels which results in lassile, headaches or irritability.

There seems to be a synergism beeen cholesterol levels in simulneous users, but coffee drinking one does not appear to significantly fect blood lipids.

The relationship of caffeine to heart disease and cardiovascular problems seems to be a weak one when considered by itself. While more than three drinks (alcohol) per day is significantly correlated with hypertension, this is independent of age, race-ethnic, sex, smoke, coffee, adiposity, or education.

While it has already been stated that people who use alcohol also use coffee and smoke, there is a stronger association between alcohol and smoking than alcohol and coffee use. Also, the use of tea seems to stand entirely by itself. (Little old ladies and people who put ice in it when it's hot.)

While it has been noted that caffeine may be related to cardiovascular problems or accidents because of sleep deprivation, this would tend to identify with caffeine addicts more than alcoholics, who more frequently arise early, drink coffee until about 2:00 p.m. and shortly begin their evening alcohol participation.

The physical symptoms of cardiac arrhythmias, ectopic beats atrial-tachycardia, are more likely to occur in individuals who are tired and also under the influence of stimulants.

Summary

Air Force people should realize that coffee is not a harmless beverage that can be safely consumed in unlimited quantities. They should review their present caffeine consumption levels and set realistic goals of abstinence or moderation.

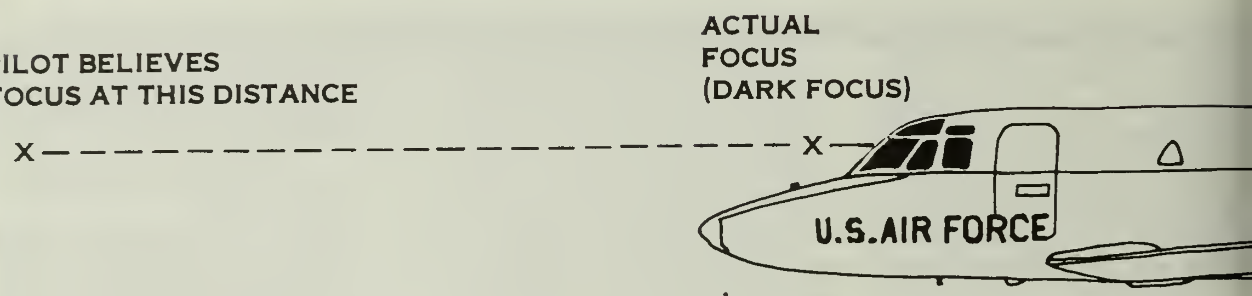
More than four cups per day or over 400 mg in a 24-hour period has been reported as beyond the upper safe limit. For a pregnant woman in her first 12 weeks of gestation, over 100 mg in 24-hours or less may be unsafe for her baby.

A great deal more needs to be known about caffeine as a possible cocarcinogenic substance. It is highly probable that we will learn more about how serious this problem is during the eighties.

For aircrew members it should be emphasized that coffee could be a life saver when moderately consumed at times demanding optimum vigilance. On the other hand, overuse after missions, might impair adequate rest and contribute to unnecessary fatigue on the next day's flight. Like most things we associate with the "good life," coffee and caffeine are just being added to the list of things that are probably harmful if abused. Because overuse has been reported to cause loss of balance, decreased cerebral blood flow and slower reaction capabilities, it is possible that aircrew members should re-evaluate their coffee drinking practices (or total caffeine consumption) before flights in high performance aircraft.

While we know of no studies which relate to spatial disorientation and coffee drinking, it is possible that overuse will be considered as a part of the more general enviromical transition into the predicted wellness revolution of the eighties. At any rate, check it out. Physiological check rides are just as important to the quality and quantity of your life as that cockpit niche you inhabit concerned with Aerospace Safety. ■

What You Think You See



...sometimes isn'

By PENELOPE NELSON • New Mexico State University • Las Cruces, NM

■ Beware the dirty or scratched windscreen. It could lead to calamity.

According to New Mexico State University aviation psychologist Dr. Stanley Roscoe, a dirty or scratched windscreen, especially when it is reflecting glare, or in combination with other factors, could cause distorted size and distance perceptions. And the pilot wouldn't even be aware he was experiencing an optical illusion.

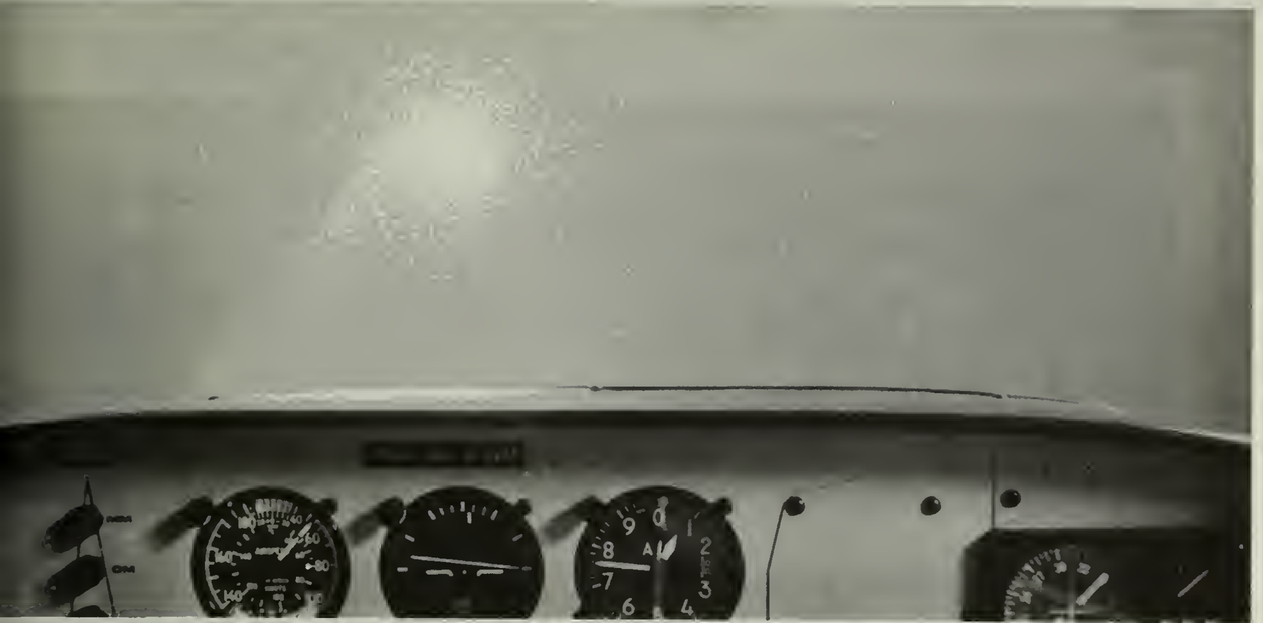
Roscoe established one of the earliest human factors research and engineering programs at Hughes Aircraft, founded the Aviation Research Laboratory at the University of Illinois, and recently opened a behavioral engineering laboratory at NMSU. He has been studying optical illusion for many years.

Even a perfectly clear windscreen could present problems. Roscoe describes a study in which a group of pilots, using a simulator, were asked to judge the threat of midair collision with various intruding aircraft. When the pilots sat in the flight engineer's seat— about two meters from the window aperture— they judged intruders to be more threatening than when the same pilots sat in the pilot's seat, about one meter from the window, viewing the same intruding planes. They were experiencing optical illusion.

For a better understanding of the phenomenon, sit across a room from a window and close one eye. Extend your thumb toward the window. Focus the open eye on your thumb, draw the thumb toward you and observe the window change size. Apparent size of an object changes with shifts in the distance at which the eye is focusing or "accommodating."

The windscreen problem hinges on something called the *dark focus,* Roscoe says. The eye focuses or accommodates to objects at varying distances. It follows that there also is a poi at which the eye is *unaccommodated,* or relaxed. This is the point the eye prefe and effort, conscious or unconscious, is required to mo the eye's focus in or out from point. This is called the dark focus because this is where th eye will focus in the dark or w there is no object or texture o which to focus. At this point, focus requires no effort at all.

Until recently this point, the dark focus, was thought to be *optical infinity,* any distance beyond seven or eight meters from the eye. Years of researc now verify, however, that the c focus is at a distance that vari with the individual but average



dirt or scratches on a windshield can cause a pilot's eyes to focus improperly which in turn alters
pparent size and distance of other objects.

neter—the distance of the
s seat from the windscreen.
enty years ago a scientist by
ame of Mandelbaum
bled upon an unexpected
omenon. From the
ened-in porch of his summer
ge, he found he could not
a sign located on the beach
he was a certain distance
the porch screen, although
ould read the sign at all other
nces.

ndelbaum then conducted
formal experiment. He asked
people to read the sign
gh the porch screen. For
observer he found a critical
nce from the screen at which
ign at the beach couldn't be
The subjects realized they
n't help focusing on the
n when they were at the
l distance, but could focus
e sign by moving nearer or
r from the screen or by
ng their heads quickly from
o side. He decided that the
, later to become known as
Mandelbaum effect," was
o involuntary
nmodation, or focus, on the
n, even though the observers were trying to focus on the sign.

This critical distance from the screen, at which the sign couldn't be read, varied from person to person with an average of one meter— the distance of most pilot's seats from the windscreen. Almost any textured visual stimulus at that distance, says Roscoe, could be a powerful focus trap.

Roscoe also cautions pilots about several other visual illusions they may unknowingly experience, which are involved in various possible pilot "errors."

When pilots make approaches and landings with any type of imaging flight display projected at a magnification of one, they tend to come in fast and long, round out high and touch down hard. The imaged runway appears smaller, farther away and higher in the visual field than when it is viewed directly.

When pilots make landing approaches over water on a dark night toward a brightly lighted city the opposite happens. The runway may appear larger, nearer and lower than when viewed directly from the same flight path on a clear day. Several commercial airliners have landed in the water short of the airport when making a night, "black hole," approach. Researchers have discovered pilots will systematically misjudge the height and "tilt" of the runway and tend to make below glidepath approaches under these conditions.

(Also affecting pilots' perception of the runway environment are such things as runway width, lighting, horizon [e.g. city lights] runway slope.—ed)

Bias errors in depth discrimination have been independently discovered by designers of such optical equipment as submarine and tank periscopes, laboratory microscopes, one-power shotgun scopes and tiny helmet-mounted TV displays. All require some optical magnification for objects to appear at the same distance

☞

Visual illusions associated with the landing environment have caused numerous accidents. Several factors may influence a pilot's interpretation of what he "thinks" he sees.

What You Think You See . . . sometimes isn't continued

as when viewed by the naked eye.

Scientists studying this mystery found the eye doesn't respond obediently to the accommodation distances called for by these lenses. The eye is lazy, Roscoe says, and reluctant to be drawn away from its resting position. The brain, however, seems quite willing to accept an amazingly out-of-focus image without conscious recognition that it is out of focus.

In one test, pilots made two judgments along the final approach: the first at 1220 meters, the second at 610 meters. With unity magnification, they indicated an overshoot on the first judgment and an undershoot on the second. If they had been flying manually, they would have tended to overshoot the aimpoint.

There are countless possible explanations for this curious reversal in judgment. But the important thing is: it happens. If a pilot is late in recognizing his low position or is slow in adding power, he may land short.

The accommodation of the eye, Roscoe says, can be forced or misled by several phenomena that can occur in flight. When the eye's focusing ability is thus disturbed, both size and distance perceptions are distorted and the pilot's responses can be biased.

Optical illusions were recognized and remarked upon by the early Greeks and Egyptians, but few correct explanations were made until this century, most of them in the past decade. And along with the explanations of the "old" illusions have come discoveries of "new," more subtle visual illusions.

Among these have been the recently discovered effects of emotion on eyesight. Anger, fear, and anxiety, can alter visual perception. Even physical discomfort, pain, possibly depression and certainly dizziness have their effects.

While this can be dangerous for anyone, for pilots it could be and probably has been disastrous. Roscoe believes optical illusions have played a part in some plane crashes, almost always attributed to pilot error, in which a skilled and experienced pilot apparently made an unaccountable error.

Scientists have documented measurable shifts to farsightedness—or nearsightedness—when people are under stress. These shifts from a person's usual eyesight

. . . Anger, fear and anxiet can alter visual perceptior Even physical discomfort, pain, possibly depression and certainly dizziness have their effects.

can last from a few minutes to several days.

It appears, says Roscoe, that sudden, brief or acute stress elicits some degree of

The brain seems quite willing to accept an amazingly out-of-focus image without conscious recognition that it is out of focus.

arsightedness. Such responses, ne says, are probably individually empered by personal experiences and can be controlled with training. Chronic, onger lasting emotional states such as anger, revulsion, and apprehension or anxiety seem to cause some degree of nearsightedness for varying engths of time.

Despite the frightening mplication that pilots cannot always trust their eyesight, these actors can be somewhat alleviated.

Several researchers, Roscoe among them, have recommended hat pilots routinely wear bifocal enses at night and when making nstrument approaches in daylight conditions. The lower section of he lenses would optimize vision or instrument panel and chart-viewing distances. The upper section, with suitable correction prescription, would help remedy night and open-field myopias. These were discovered long ago, but most pilots are unaware of he effects of this distortion and prefer to believe their "perfect" vision is perfect.

To combat the possible problems in *black hole* approaches over water at night, Roscoe recommends that lead-in ight buoys be considered for use at those major airports that have his approach problem. He suspects that the pilots who tend o make low approaches at night and occasionally land in the water are those who happen to have an extremely distant dark focus. The wearing of corrective lenses at night could alleviate the problem.

The use of head-up displays for night and instrument approaches, Roscoe says, needs a lot of further investigation. Advocates have tacitly assumed that such displays prepare the eyes to see, immediately and clearly, whatever is out there to be seen. Recent research findings don't support that assumption, says Roscoe. This type of image doesn't necessarily call the eyes to a far accommodation distance. A pilot breaking out of the clouds requires a very rapid shift to distant focus, and the scene "explodes."

In addition to basic eyesight and color vision, the dark focus or resting accommodation distance should be considered when selecting and assigning pilots. A distant dark focus might be a basis for assignment to military air combat duty; those people should be less troubled by empty-field myopia. Pilots with a nearer resting position should wear corrective lenses, he says.

As pilots get older their resting accommodation may retreat into the distance. In some cases it retreats far enough that a pilot, who previously has had no difficulties, would have serious problems in making the black hole approach.

Pilots undoubtedly learn to compensate for the biased distance judgments they experience in flight. They obviously have had to adapt to perceptions altered by speed and height above the earth. Roscoe says a pilot, once he realizes he can't always trust his eyesight, can learn to recognize the circumstances under which he should suspect altered vision; he can learn to compensate and even to gain some voluntary control over his eyes' accommodation.

Learning to control accommodation is similar to learning to wiggle one's ear or move one's scalp. The most successful accommodation training experiments have used biofeedback in which the pitch of a tone automatically changes as the eye focuses at different distances, making the participant aware of his accommodation. Several studies show good transfer of this training to other situations.

Specific training to recognize when visual illusions are likely to occur, and how such illusions are likely to distort the actual scene would expedite and improve the pilot's natural ability to compensate for the occasional differences between "what it looks like" and "what it really is."

(For further information on this subject there are several audiovisual products such as TS1414 "Visual Illusions," TF6140 "Landing Illusions," and a MAC series depicting landing illusions at a number of bases.) ■

A Page From The Past
Balloons Or Bombers

■ Flying accidents are neither new nor funny. However, in digging into old accident records there can be found cases that would give today's flying safety officer or accident investigator many a headache. And the problems that some of the early flying machines gave the embryo pilots approach the fantastic when considered in the light of our present day thinking and flying.

Take, for example, in 1918 when balloons were still an important part of military aviation, a claim was put in against the government for a twenty-dollar bill. It seems that during a routine training flight, a cadet found himself being carried out toward the ocean. He dropped some of his ballast and rose up to 8,400 feet to catch another wind and reverse his direction. Arriving inland he valved down to 2,000 feet, spotted an open field and decided to land. When close to the earth he was picked up by a 25-mile-an-hour ground wind which carried him toward some high tension wires. He tried all deflationary measures but these functioned too slowly and the basket caught on a telephone wire, with the balloon, partially deflated, bobbing around in the center of the road.

About this time a "horseless carriage" came whipping down the road at a fast 15 mph and the driver hesitated and then decided to try to pass under the balloon. The cade yelled at him to stop, but the dri either did not hear or disregarded the warning and went on. As the auto came directly under it, the balloon, driven by a gust of winc completely enveloped the car. Th occupants of the car jumped out headed for safety while the drive tried to cut the machine free. A moment later the gas in the ballo ignited, either from contact with hot radiator or from an engine spark, and an explosion occurred The car caught on fire and was completely burned. The driver sustained first and second degree burns on his face and hands. He placed claims against the

›vernment for the twenty-dollar ll which happened to be in a ›cket of a coat in the car, the coat, e car, a fur scarf, a wool sweater ıd three baby pillows. How would day's accident investigator figure at one?

Another cadet was at 3,600 feet in balloon when he heard an :plosion and noted that he was pidly descending. He jumped from e basket, but in doing so caught s parachute ropes on the map ›ard and found himself dangling ›out a foot below the basket. He imbed back into the basket, but by e time he had untangled the ropes, was too late to parachute. He ayed where he was and rode safely to the ground in the balloon, which had fallen approximately 1,000 feet and then, with the deflated bag acting as a canopy, had become a parachute in itself. Out of this came a recommendation that students be instructed during training not to put their map boards on the side of the balloon from which they must jump, should an emergency arise.

High winds frequently played havoc with the balloons. A gale in Southern California caused the destruction of one, while two others broke completely away from their moorings. The one destroyed was ripped by a large piece of metal which the high wind carried through the air. The other two, although securely tied with ¾-inch rope and ballasted with heavy sand bags, were torn right out of their beds. Another time a sudden gust of wind caught a balloon that was anchored to a winch by a steel cable and snapped the cable, allowing the balloon to float free. An energetic lieutenant chased it on a motorcycle and was finally able to catch its drag rope and bring it back to earth.

Balloon problems were strange enough, but when the airplane came along it brought new angles which at times were even more odd. Unique in its way was a crash that happened in those early days that found the pilot dazed but unhurt, with his engine in the tail of the plane, it ☞

A Page From The Past

continued

having passed under or over him in a manner still unexplained.

Another crash occurred after two pilots had spotted a large number of ducks in a certain area. They returned to the base, secured shotguns, and took off in a two-seater. Apparently they flew too low or slow, because they crashed during their airborne duck hunt. The accident was chalked up to a stall with insufficient altitude.

The ground crews had their troubles, too. In fact, mechanics were killed test-flying and crashing the planes on which they were working. They did not have the problem of jet exhaust but quite a few were hurt by revolving props.

Two reports can be found of pilotless crashes. The custom was for the crew chief to warm up a plane and then leave it idling while he placed it in position to taxi. On a certain type of plane, the lifting of the tail to turn the plane about could cause the throttle to advance. On one occasion the plane "took off" and then ground-looped on a nearby road. Another time the pilot standing near the plane was knocked flat. This plane also ground-looped and ended up on its back.

Wording of accident reports was often very brief and *not* to the point. "Machine turned over and fell into a lake." "Unauthorized attempt to change from rear seat to front." "Fell out of plane." "Stick or prop broke," are some of the examples.

Accident boards had a knack of coming up with some unusual recommendations. Here are a couple of samples:

"A speedometer or airspeed indicator is one of the worst things to put on a training machine, as a pupil very soon relies on his instrument, which is generally wrong (none are accurate), and becomes a mechanical flyer, rather than a pilot with the proper 'feel' of the machine"; and "hard helmets interfere with the use of goggles and the turning of the head."

Another recommended the use of mirrors to enable the pilot to see behind and to the side, but this was later rejected when it was decided that it was better for the pilot to put his head on a swivel rather than rely on gadgets. One suggestion called for the placing of enlisted men on pilot status in order to take some of the glamour and thus some of the recklessness out of flying.

One man wrote to the President suggesting that the structural iron workers' rule of quitting work for the day when a man was killed, be taken up by the Air Force. He stated that he had noted that death came in bunches of three and four in the same day at the flying schools.

One of France's chief pilots during World War I recommended his safety principles of excess speed, excess altitude and a constant lookout for places to land. At least the last of these principles is still considered a good one.

Some of the board findings were much more practical. One was a device which would throw a student off the controls if he became frozen on them. Others were hard helmets, this in contradiction of the earlier board's findings; an indicator to show maximum speed limits; landing and takeoff patterns, strengthening of a structural design, and that students be given training in forced landings while in flight school.

In the period from 1908 to 1920 there were 2,080 hours flown for every fatality, with 506 killed durir the 12 years. On the field which showed the worst record, 20 pilots were produced for every one killed Even so, the overall safety record was better than that of any other country flying at the time. Considering the equipment used an the little that was known about weather, safety devices and aviatio as a whole, the safety records were not so bad. They would be alarmin today, of course.

Then, as now, the main causes f fatalities were carelessness and the disregarding of safety rules. Every year since airplanes came into being, some crash causes have beer buzzing; acrobatics with insufficien altitude; failure to wear parachutes; exceeding limits of the aircraft; rate of speed too great on landing, and so on.

The men who flew airplanes whe flying was a brand new game had t learn their safety lessons through th hard knocks of experience – trial and error. Today we can profit by their mistakes and by the mistakes of all those who have followed. Th rules of safety have been written fo us . . . sometimes in blood. Let's not disregard them.

(This article appeared in January 1952 when there were 2,274 major aircraft accidents for a rate of 29 p 100,000 hours flying time. In 1979 we had 94 class A mishaps [roughl equivalent to major accidents] and rate of 2.92. We've come a long way baby. – Ed) ■

THERMAL STRESS

■ The flightline is getting hotter and hotter and the cockpit is becoming a regular Dante's Inferno. All that heat generated by the summer months can affect you to the point where it becomes dangerous. Exhaustion can set in causing fatigue and mental confusion. Symptoms are moist skin, profuse sweating, increased pulse, slightly decreased blood pressure, and shortness of breath. In some cases, cramps or even a stroke could occur. In order to avoid these dangerous and sometimes fatal results of thermal stress, there are several things you can do.

First, slow down. Don't try and keep the same pace you're used to. Give yourself extra time to accomplish a slow preflight. Also, avoid sitting in the cockpit with the canopy closed for a long period of time. Be extra careful if you spare out and spend more time than usual on the ramp. That extra time sparing out can sneak up on you and dangerously affect your performance in the cockpit. Equally important is the accumulation of ramp time during two or three turns in one day. All this extra time could lead to overexposure.

Just as important as overexposure is dehydration caused by sweating and evaporation. To avoid this, drink plenty of water. You should drink a minimum of two or three quarts of water per day. It doesn't increase sweating and as long as you're thirsty, you will not overhydrate.

A proper diet is another consideration. If you eat a normal diet, salting your food is much better than taking salt tablets. If you think additional salt is required, see your flight surgeon. Protein can cause an increase in your heat production and can contribute to thermal stress, so a low protein diet is best.

Finally, don't press! Heed your body's warning signs. If you feel you're overdoing it, call it quits. Seek a cool place to rest and drink additional fluids. If you really feel bad, see the Doc!

Your body can become used to the heat providing you take it slow initially and avoid overdoing it. It will normally take two to three weeks but, if the above steps are followed, it should help your body to become fully acclimatized in a safe manner. — Major Brower, HQ ATC/IGF. ■

MAJOR

Robert G. Little, Jr.

CAPTAIN

Steven J. Austin

48th Tactical Fighter Wing

■ On 12 December 1979 Major Little, Aircraft Commander, and Captain Austin, Pilot Weapon System Officer, took off from RAF Lakenheath in an F-111F on a night low level sortie. On return to base, Captain Austin flew the aircraft through a GCA approach to a normal touchdown. After a short landing roll, the crew heard a loud bang, the left wing dipped, and the aircraft careened left toward the edge of the runway. Both pilots countered the yaw with full right rudder. Major Little decided the only way to regain control was to take off again so he selected full afterburner and initiated a go-around before the aircraft departed the runway, thus preventing probable catastrophe. The crew were informed by the Runway Supervisory Officer that an explosion had occurred. Major Little left the aircraft in landing configuration and requested emergency inflight refueling due to high fuel consumption in this configuration. A KC-135 tanker on final approach to RAF Mildenhall was diverted and rendezvous at 4,000 feet initiated. Poor visibility in rain and snow showers made visual contact extremely difficult and, during join up, Major Little's aircraft lost all utility hydraulic pressure and the left generator. Moderate turbulence seriously hampered refueling operations and, combined with reduced maneuverability of the aircraft in the landing configuration, caused several disconnects during the half hour ordeal. A visual inspection of the F-111 by the Aircraft Commander of the KC-135 confirmed that the left main wheel was missing and that only the broken strut remained. No emergency procedures existed for landing with the loss of a wheel, and it was unknown whether the aircraft would cut the barrier, cartwheel after touchdown, or veer off the runway. All possible precautionary actions had been completed and a 3,000 foot strip of fire retardant foam had been laid. Major Little flew a perfect approach to touchdown in the center of the runway in the foam strip and short of the BAK 12 barrier. Despite efforts to keep the left main gear strut off the runway until past the barrier, the aircraft began to settle and drift left. Believing he may have missed or severed the barrier, and with control inadequate to prevent the aircraft from continuing to drift left toward the runway edge, Major Little used afterburner and flight controls to right the aircraft in preparation for a go-around. This action stopped the drift and resulted in barrier engagement without severing the barrier. A fire erupted as the F-111 slid to a stop. Major Little and Captain Austin egressed the aircraft as soon as the engines were shut down, and firemen extinguished the flames within seconds. The professional competence, skill, and superior crew coordination displayed by Major Little and Captain Austin contributed to the successful recovery of this aircraft. WELL DONE! ■

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TATES AIR FORCE

Well Done Award

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to the
States Air Force
dent Prevention
Program.

CAPTAIN

Wilbur R. Hamilton

SECOND LIEUTENANT

John C. Peterson, Jr.

27th Tactical Fighter Wing
Cannon Air Force Base, New Mexico

■ On 9 October 1979 Captain Hamilton was instructing Lieutenant Peterson, a student aircraft commander, on his first flight in an F-111D. Shortly after takeoff, as the slats were being retracted by the student, the aircraft began to roll sharply to the right. Captain Hamilton immediately assumed control of the aircraft and continued the climb to a safe ejection altitude while analyzing the control problem. The flap and slat indicators indicated that the slats had failed to retract but that the flaps were fully retracted. Given this particular flap and slat configuration, there was no explanation for the right rolling tendency. Attempts to lower the flaps and slats by normal and emergency means were unsuccessful. Captain Hamilton quickly determined that 270 knots was the optimum airspeed for lateral aircraft control. He placed the right throttle in afterburner to help counter the right rolling moment and the left throttle near full military power to maintain the desired airspeed. He was required to hold full left stick to maintain wings-level flight. The resultant high fuel consumption rate severely decreased the time available to plan a course of action. Cannon supervisory personnel meanwhile had coordinated with Strategic Air Command to scramble a KC-135 alert tanker from Carswell AFB, Texas for an in-flight refueling. Thirty-three minutes after takeoff, another F-111D joined with them and reported that the left flap was still partially extended while the right was fully retracted. The crew climbed to a higher altitude to perform a controllability check, and found the right rolling tendency uncontrollable below 230 knots. With less than 15 minutes of fuel left and the KC-135 still 30 minutes away, Captain Hamilton elected to land and engage the approach end barrier. After lowering the landing gear, he determined that the aircraft could be controlled down to an airspeed of 180 knots. On final approach, Captain Hamilton used full left control stick and nearly full left rudder to maintain a wings-level attitude. A successful landing was made with an approach end cable arrestment. Captain Hamilton and Lieutenant Peterson's decisive actions, superb flying skill, and cool inflight analysis were instrumental in the successful recovery of a valuable aircraft. WELL DONE! ■

KC-10
First Flight

AEROSPACE

MAGAZINE FOR AIRCREWS SEPTEMBER 1980

Pressing Problems . . . see page 5

Minding The Store

■ "A good cockpit manager is an alert problem anticipator, an informed risk evaluator; and an effective delegator of duties who keeps a suspicious eye upon his surroundings. . . ."

Some time ago, A B707 aircraft was making an approach in 200/½ weather. Ahead of him, an L1011 with a hydraulic problem had landed successfully. The B707 captain noticed that the localizer was erratic during the latter stages of the approach. He was able to average out the excursions, but his suspicions were aroused. He found the runway in good position to land, but he went around on his suspicions, discovering the L1011 parked on the runway as he went around!

In another incident, a DC8 approached a runway reporting a 500 foot ceiling with one mile visibility. The first officer, who was flying, looked up at 400′ and saw what appeared to be strobes identifying the runway end. However, he *looked* at what he *saw* and successfully avoided a collision with another aircraft with wingtip strobes flashing.

These pilots were minding the store, an expression which might well be phrased to expect the unexpected. Fortunately, incidents such as these are incidents instead of accidents because most pilots have learned the trick of keeping an eye on both the front and back door, never allowing an intruder in the form of emergency, distraction, or complacency to keep them without an exit. For those who have not yet cultivated the sense of awareness on good storekeeping, here are a few questions which you might ask yourself:

- Do you study the flight plan complete with NOTAMS, weather, etc., or do you just read it?
- When you check the Maintenance Log, do you go back far enough into previous pages to get a history of problems past which may become problems future?
- While preparing for takeoff in poor weather, are the departure airport approach plates handy for an unexpected quick return?
- On lining up for takeoff, are there any birds, ditches, ground vehicles, etc., in close proximity?
- During the initial pre-V_1 takeoff roll, are you thinking abort instead of go?
- During the takeoff, have you considered other problems beside engine failure?
- Throughout climb vectors (as well as descent) are you physically building fences with VOR radials, etc., or otherwise mentally keepi track of terrain or traffic hazards
- If an emergency or other distracting problems arise, has o crewmember been positively identified as *the* pilot to fly the aircraft while the others solve th problem?
- In cruise, are your thoughts including the weather at your alternate as well as at your destination?
- When everything is going s right that you feel good inside, d you start instinctively looking around for what could go wrong
- On approach, are you lookir for those same runway hazards th you watched for on takeoff?
- During an instrument approa will you be expected to follow th published missed approach or wi you be vectored?

This could go on ad infinitum. The point to be made is that a go cockpit manager is an alert probl anticipator, an informed risk evaluator, and an effective deleg of duties who keeps a suspicious upon his surroundings with a positive confidence while mindin the store. — *Western Airlines Me to pilots*. ■

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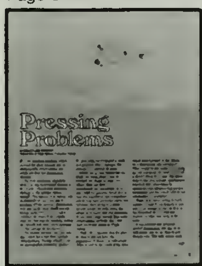

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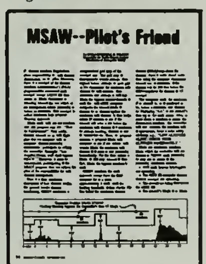

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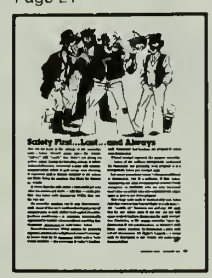

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Something Is Wrong. what should I do?

By MAJOR TERRELL J. OSBORN
Directorate of Aerospace Safety

■ While performing some air work, the crew experienced an engine flameout. It was an emergency, all right, but not of the "extreme pucker" variety. Just advance the other throttle, pick up windmill speed and restart the dead engine. It seems simple enough. Just one problem. The pilot left out one of those steps. He didn't maintain the recommended restart speed. The pilot did not realize he was holding much too slow an airspeed. He finally gave up and ejected, only to have the aircraft pick up speed and perform its own airstart after he ejected. An isolated occurrence? Not exactly.

During a recent 12-month period, crewmembers experienced nine aircraft emergencies (three of the were simulated) which they did n analyze properly. In each case, th crew used the wrong procedure a bashed the bird. Here is a recap eight of those mishaps:

- Throttle failure. Didn't do th checklist steps; ran off the end o the runway because of a failure t shut off the engine.
- Throttle failure. Didn't anal the problem and used the wrong procedure, resulting in hydraulic failure and ejection.
- Compressor stall. Landed ho and ran off the end of the runwa
- Engine failure (two-engine aircraft). Didn't follow the check and used the wrong procedure. L control.
- Student pulled the gear up e on a touch-and-go landing. An afterburner go-around could have salvaged the situation, but the student didn't use afterburners.
- Simulated engine failure for landing (two-engine aircraft). Go slow and lost control.
- Simulated engine failure in flight (two-engine aircraft). Did maintain control.
- Simulated engine failure on takeoff (four-engine aircraft). Lo control.

There are many thousands of emergencies experienced by our crews each year, and the vast majority cope successfully with t problem. However, this review indicates that emergencies (both and simulated) are unforgiving o errors.

What about minor problems w don't really classify as emergenc Well, here again, some of our

members have turned little
lems into mishaps by not
yzing the situation correctly and
taining aircraft control. Here is
ap:

While flying a low-level nav
ion, the pilot aborted for
her. He ran into a mountain.

While attempting to find a VFR
to base, the pilot encountered
weather and ran into the ground.

While flying a low-level nav
ion, the pilot aborted for
her. He forgot to cross-check
nstruments and lost control.

The primary attitude reference
d while operating in the
her. Although two other
ences and another crewmember
readily available, the pilot lost
rol.

The pilot allowed the airspeed
eed off in the holding pattern.
le attempting to gain some
eed, the crew lost control.

A crewmember experienced an
com problem. While the crew
working the problem, the
aft landed gear up.

The pilot had to go lost
man. He didn't transition to his
uments and lost control.

During rejoin, the pilot lost
of lead. He didn't take proper
n and collided with lead.

lthough the problems
untered by these crews were not
tly routine, they should have
readily able to cope with the
tions. In each case, the crew
time to analyze the situation and take the proper action. But, something went wrong.

During this period, there were also eight crews that inadvertently placed the aircraft in a dangerous situation that required immediate action. These were of two types: stalls and unusual attitudes. However, in all eight cases the crews had sufficient altitude and time to make a recovery. And, in each case they used the wrong techniques and lost the aircraft.

Landing patterns should be fairly routine. Still, three pilots allowed excessive sink rates to occur, realized the errors, then took the wrong courses of action. Fortunately, they all walked away, but the aircraft were heavily damaged.

Thus far, the emphasis has been on the pilots. However, in two cases, another crewmember realized a problem existed, but failed to act where action was needed.

- A rear seat IP was making a landing but lined up left of the runway. The front seat student let him land short and left of the runway.
- During multiple fly-by's, the wingman realized lead was flying too low, but he didn't speak up. On the next pass, lead hit a building.

What can we learn from this summary? Obviously, in this one year period 30 crews experienced problems, realized they had problems, selected the wrong courses of action, and, consequently, experienced Class A/B mishaps. There are some additional points of interest in these data.

Five of these "failure to cope" mishaps involved weather operations. Weather complicates otherwise routine problems, sometimes with very little warning. Crews must be prepared for weather and ready to fly instruments. And, when operating at low altitude, they must have a plan firmly in mind for when weather causes a change of plan. A sudden encounter with weather is no time to begin to think about how to handle the weather problem.

Nearly all of these 30 mishaps involved situations that developed suddenly. The shock of the initial problem and the rapid buildup of ☞

Something Is Wrong continued

stimuli surely tended to create task saturation and confusion. Very few of these situations are "played out" in simulators. There can be a big difference between practicing the out-of-control recovery procedure in the simulator and actually accomplishing it in the "real world." The "pucker factor" just isn't the same in the simulator.

Approximately half of these mishap sequences started with an error by the crew. No matter what the error, whether it is a stall, an unusual attitude, or a sinking base turn, realizing an error has been made tends to be all-absorbing. A person has a tendency to dwell on his error instead of concentrating on handling the problem. When faced with a sudden, low altitude, diving, unusual attitude, is not the time to be thinking "how did I get into this mess?" It is time to be "cool," and concentrate on taking the right course of action. There will be plenty of time later to sort out the error that caused the original problem.

Although approximately 80 percent of our non-FOD Class A/B mishaps involve fighter/attack/observation/trainer aircraft, 93 percent of the "failure to cope" mishaps involved these "smaller" aircraft. This doesn't imply that "fighter pilots don't do it better." The exposure to the risk of many of these types of mishaps is higher for tactical and trainer crews.

The taskload per crewmember is relatively high in tactical scenarios, and situations involving unusual attitudes and loss-of-control are very unforgiving. Consequently, the margin for error is reduced to a minimum for tactical crews much of the time.

In two of these cases, there were crewmembers who could, and should, have interceded in the interest of safety, but they did not. There can be no excuse for realizing the other person isn't coping, yet doing nothing about it. The crewmember who is "just along for the ride" shouldn't be doing it in an Air Force aircraft.

There is no doubt that we need to reduce the number of times aircrews try, but fail, to cope with serious, unusual situations. Here are some thoughts on ways to improve the odds.

Be mentally prepared for problems, particularly those involving weather. Remember that aircraft control must come first.

Make more effective use of "situation" emergency training. Only one of the 30 mishaps involved a "boldface" emergency. The others involved situations requiring speedy, careful, analysis, not reflex response. Obviously, practicing the emergency procedures in the simulator is useful. However, that training is more realistic and interesting (and, therefore, remembered better) if it is situational. In addition, flight briefings, safety meetings, and "bar talk" sessions are excellent settings for discussing critical situations ahead of time and becoming mentally prepared. It is one thing to read about an F-4 out-of-control procedure in the Dash One. It is another thing to have an "old head" talk about the yaw sensation, violent

rolling departures, the sudden unload/hang in the straps, confu recovery rolls and the tough-to-make ejection decision.

"Don't worry about spilt milk It requires a lot of mental discip to not become preoccupied with you lost control of the aircraft, b this discipline is absolutely necessary. To think about anythi but the recovery procedure is probably to lose the aircraft—an yourself. Again, crews must condition themselves ahead of ti for such situations.

Help your buddy. If the guy in the other seat or your formation mate is making a mistake, let hi know. If he has a problem and is coping okay, just stand by and b ready. But when things go wron and you know the better way, it' time to help. The alternative ma to attend the memorial service a wishing you hadn't been so shy.

Pressing Problems

MAJOR JIM STEWART
ctorate of Flight Safety, Canadian Forces

Two Hercules incidents which ssed my desk recently got me king (for which reason you ld say they are noteworthy eed).

he first involved a departure n a newly constructed airfield in Arctic. The aircraft sustained nage to the tailskid during off. The runway was bumpy and bout 80 kts the nose wheel nced off the runway. Rather than putting the nose down into the nps again, the pilot elected to tinue the takeoff run slightly e up. Subsequent bumping during takeoff roll most likely accounts the damage to the tail skid.

he second incident (just the next) could have had more serious sequences. During takeoff from uncontrolled airfield in Quebec the port wing tip contacted a shrub and received minor damage. The runway was covered in mud.

Before we go any further let me make one thing clear! I am not pointing the finger at these two pilots. They are both very experienced and competent. I, in fact, hold the personal belief that it was this experience and competence which may have prevented these two incidents from being of a more serious nature. In both cases, the crews were faced with the challenge of operating large aircraft into short, unmaintained airfields. So — how does all of this relate to Flight Safety?

Well — let's suppose that the pilot in control did not have the experience of these two individuals. What would be the result if the nose wheel were lowered to the runway, hit a large bump and collapsed? What would be the result if the wing tip had contacted the mud instead of a shrub? What if, in fact, the pilots were brand new aircraft commanders who had little experience in operations into airfields that are not maintained and for which little or no information is available?

There is no point saying it can't happen, it can! It can happen to you and it can happen to me. In fact, it has happened to me! And that, readers, is what this story is all about.

I was a brand new Hercules aircraft commander and one of my first duties was in the Search and Rescue role. This role entails some ☞

of the toughest flying one will ever do in a Hercules. Low ceilings, poor visibility and there you are cranking around a 130,000 lb airplane at low level.

My first SAR launch was a search in Quebec, north of Bagotville. We filed our flight plan and boarded the aircraft. During startup Base Ops advised that we were to deliver the searchmaster and his team to Chibougamau where they would establish search headquarters. We boarded the party and rushed to make our takeoff time within the allotted two hours after callout.

During taxi the searchmaster asked on intercom if, in fact, 3,500 feet of runway was acceptable for landing a Hercules. Sounded all right to me so we launched off into the low cloud and rain which covered our transit to Chibougamau as well as our search area.

Enroute we began to get a little more professional. We consulted the letdown book and the charts and realized that Chibougamau had a runway length of 3,800 feet. Our ground roll was about 2,400 feet, so we needed 2,900 feet to do a maximum landing. No sweat – we had lots of runway! An added bonus was the fact that the runway surface was gravel. This would help to eliminate the problems associated with landing on a wet runway.

About this point the eagle-eyed flight engineer mentioned that we would be at maximum recommended landing weight and would have over 6,600 lbs of fuel in the outer wing tanks.

(Technical break – the Hercules aircraft is restricted, on landing, to a sink rate of 540 fpm. If, however, you have over 6,600 lbs of fuel in the outer wing tanks this figure is reduced to 300 fpm. Further to this, almost all Hercules fires on landing are caused by hard landings which break the wings and release fuel from the tanks. Got the picture?)

We effectively solved the wing fuel problem by remembering to brief a 300 fpm sink rate on landing. Piece of cake – right?

We also received a weather report for Chibougamau and it was not encouraging. It was 700 overcast with rain and haze and the wind was 90 degrees off the runway at 20 gusting to 25 knots. We flew an NDB approach, broke out at about 700 feet AGL and transitioned to a maximum performance visual approach. (Time for a break.)

Our blueprint for disaster is coming along nicely. Let's just review the box we were building and see what we did not have going for ourselves:

- 3,800 feet of gravel runway with a raised portion in the center area at the 2,000 foot mark,
- wing fuel such that sink rate at touchdown must be below 300 fpm,
- wind 90 degrees off at 20 kts with a 5 kt gust,
- ceiling at circling limits and limits for the maximum performa landing,
- reduced visibility in rain and haze,
- no information on runway condition,
- transitioning in minimum weather for a maximum performa landing without the benefit of an orientation pass.

As we broke out we saw that final approach path was crossed high power line. Past the power was a downslope for about half mile and then an upslope to the runway. This necessitated a dive down to the runway after passing power line with the subsequent hazard of misjudging the upslope the runway environment. The aircraft was flared just over the of the gravel surface.

Unfortunately, as so often happens, the mind was so busy collecting and compensating for marginal conditions that an important visual cue was not registered.

The end of the gravel was not fact, the end of the runway. The gravel had been pushed over the of the runway and was very effectively masking a hazardous on the runway threshold.

The aircraft touched down in center of the runway with wind correction applied, 20 feet short the actual threshold. We contact the lip of the runway in what can only be described as a controlled crash. After a thorough walkarou by the flight engineer, we flew b to Trenton, entered a heavy land in the MRS and requested a thorough heavy landing check.

Not a super day by any standa but we were extremely lucky! Deciding to press on regardless of the marginal conditions could ha resulted in a flaming wreckage a the end of the runway.

Since arriving at DFS I have

ced that this was not an isolated dent. There are many pilots out e who press on with the mption that they can handle all litions. General aviation still , as the major cause of dents, pilots flying into weather cannot handle.

nyhow, you say, what's the t of all this? If we don't want to e accidents, we put them in the and leave them there— right? ONG! We have a job to do. The is to do the job in the safest possible. Flying entails risk. re is no way around this. The stion is— what risks can we ept and still safely accomplish mission? There are no easy wers.

know, in my case, after bougamau, when I was forced to rate without any factor on limits, ent considerably more time luating just how my aircraft's formance would be affected. If I two factors on limits I knew I going to have to be alert to the bined effects of the conditions. had more than two factors on its I reevaluated the importance my mission and weighed the ions available. These options ld be as simple as a hold until ditions improved, landing on another runway or as demanding as a diversion to another airfield. In any event, the purpose was to set a priority on the mission at the operator level.

You may think that some commanders at this point are saying— WHOA, ENOUGH! We'll never get the job accomplished if every pilot refuses to fly to the limits of his aircraft. Well, commanders are also interested in safeguarding their resources, and their biggest resource is personnel— YOU!

Besides, I am not suggesting a reduction in what are proven safe limits of aircraft operation. What I am suggesting is that mentally and physically we may be able to cope with one or two marginal conditions but if we continue to accept additional marginal conditions we may overload ourselves. We then begin to miss important information and have set the stage for disaster. Each of us must set limits on our own performance capabilities. If we don't understand our limits there exists the chance of unknowingly exceeding them.

One of my first pilot instructors made an interesting observation. When he became a pilot instructor he realized that he had to establish limits of performance for himself. For six months he allowed his students to fly to his limits with the confidence that he could recover. During one mission when the student lost control close to the instructor's limits, the instructor realized that he had left himself no margin for error. He then had to back off the allowable student limits to ensure that his own personal limits were not exceeded by the time he physically took control of the aircraft. A basic concept, you say, but it is a concept that is, at times, neglected in the effort to accomplish the mission. — Courtesy No 1 1980, *Flight Comment.* ■

"The aircraft touched down in the center of the runway . . . in what can be described as a controlled crash."

Tell it LIKE it is

■ Today was a special day for John, his first official act as an instructor pilot. The mission: a recurrency ride for one of the line pilots. Frank, the line pilot was in the front seat. John, sitting in the back seat was closely monitoring the engine start and was thinking: Boy, I hope things go good today. The boss is really getting up tight about late takeoffs and crew screw-ups. If we can get off on time and the ride goes well, it might look like things are turning around a bit. Better quit daydreaming and get to my own checklists.

Both engines were running now. John and Frank were preparing the aircraft for taxi. The crew chief had removed the chocks and was positioning himself for the aircraft to taxi when the trouble started. Frank was attempting to set his ADI when he realized the knob was loose.

"John, I've got a problem. I can't set my ADI. I think the set screw or something must be loose."

John began thinking, Oh, No! Ten minutes to take off and this has to happen.

"Can you get it to move at all, Frank?"

"I don't think so," replied Fran "I'll get ground to take a look at it."

Frank unlocked his canopy in preparation for the crew chief, but his attention was still on the ADI. He thought to himself, maybe if I apply a little side pressure while rotating the knob . . . Hey! It works! "Got it, John! I've found a way to set the knob. No need for ground, let's press on. If you're ready, power is coming up!"

IAJOR ROGER JACKS
ctorate of Aerospace Safety

Ready, Frank,'' answered John. at's great. I think we can make on-time takeoff.''
Roger that!'' adds Frank.
hey taxied to the active, got a e over from mobile, received r takeoff clearance, and moved position on the runway.
Okay, Frank, the takeoff is all rs. Make sure you're all set re we roll. I'm ready now. ks like we've got an on-time off in the bag.''
ast minute checks were ormed, and the aircraft began ng down the runway. Engine ruments looked good as the nose ted into the air. Suddenly, the t canopy began rising into the d stream. Shortly thereafter it ently ripped off the aircraft.
n quickly told Frank, ''I've got aircraft.'' Control was sferred and John set the nose el back onto the runway. Brakes e applied and the aircraft stopped short of the overrun.
Frank, are you okay?'' asked n. The question fell on deaf ears Frank was engulfed in barrassment. Damn it. Boy, did I v it! How could I forget to lock canopy! What do I do now? If I n up to it, the boss is going to go ugh the roof. My chance of ever oming an IP will be slim or none admit to this one. I'll never live this one down . . . if I don't admit anything and just act puzzled it might be pretty tough to prove anything.

''Hey, Frank! Are you okay?'' repeated John.

''Uh? Oh, yeah, I'm okay. Wow! That was some ride. I don't know how that happened. Canopy looked good to me before we took the active.''

It wasn't long before the safety officer was on the scene and the investigation began. During discussions with the pilots, both crewmembers confirmed their cockpit canopies were down and locked. Neither one remembered seeing a canopy unsafe light. Maintenance investigations did not produce any defective parts or maintenance malpractices. Both operation and maintenance staffs began to worry about the possibility of an unknown deficiency in the canopy locking system. All base aircraft of that type were grounded for a one-time inspection. A message was sent to the Air Logistics Center describing the problem. They, in turn, grounded all USAF aircraft of that type for a one-time inspection. The canopy locking mechanism of the mishap aircraft was shipped to the factory for analysis. AFISC, MAJCOMs, and the numbered Air Forces assigned action officers to monitor the progress of the mishap investigation. Air Force engineering experts reviewed factory design specifications of the canopy locking mechanism in hopes of finding a reason for the failure.

Hundreds of people from numerous organizations were actively seeking an answer to the unexplained departure of the aircraft canopy.

Only one person knew it was a wild goose chase. Frank was not a bad officer. In fact, he was extremely capable and had accumulated an outstanding performance record. He was a good pilot and well thought of in the squadron. A combination of circumstances put Frank into a perceived corner of no escape. All the choices were poor, but in light of recent happenings in the unit an unexplainable cause looked the best. After all, the aircraft is sound, no one is going to be put in danger by not telling the truth. Maybe what he didn't realize was the enormous amount of people, equipment, money and time the Air Force would use tracking down a ghost.

Integrity has always been the cornerstone to an effective military organization. It's not my intention to get into a lengthy discussion on integrity but, rather, to illustrate the resources that are needlessly tied up or consumed when the facts of a mishap are deliberately hidden. Austere budgets, manpower problems and hard-to-get aircraft parts give added emphasis to the importance of integrity. ■

A Form In Your Futur

By MAJOR DION W. JOHNS
4th Tactical Fighter Wing/S
Seymour Johnson AFB,

■ How sharp are you on the AFTO 781? A recent mishap involving a double compressor stall on takeoff could have been avoided if a Vari-ramp write-up had been put on a red X rather than a red diagonal. Technical Order 00-20-5 describes who writes up what in the AFTO 781. Here's a little refresher course.

General Information

Symbols will be entered in the SYM block of the AFTO 781A to reflect the seriousness, in the opinion of the individual making the entry, of the particular discrepancy.

Ground abort discrepancies will be documented on the AFTO Form 781A by aircraft personnel only. The first discrepancy in such cases will be preceded by the notation "No Flight-Ground Abort." No entry is required in Block 10, FLIGHT CONDITION DATA of the AFTO Form 781H when a ground abort occurs.

The pilot or aircrew member will enter all defects noted before, during, and after each flight. They will not, under any circumstances, enter more than one defect in each block. However, they may use as many discrepancy blocks as necessary to completely describe a single discrepancy.

Prior to each flight, the pilot will review all discrepancies listed on the AFTO Form 781A and 781K. The pilot will not include in the remarks any discrepancy previously listed, unless the discrepancy is considered more serious than represented.

The pilot or aircrew member will enter their signature and grade in the DISCOVERED BY block for each discrepancy recorded.

When remarks are entered in the discrepancy block to denote specific attention to an item or situation, the remarks will be entered as follows: "NOTE— Do not operate hydraulic system, accumulator removed." The remarks may be underlined in red. The word "Note" will never be entered in the symbol block. When required, only the applicable red symbol will be entered in the symbol block to denote the seriousness of the entry.

When an aerospace vehicle has:

- made a barrier arrestment attempt/engagement,
- been involved in a ground or air incident,
- encountered severe turbulence during flight,
- made contact with a foreign object,
- been damaged in an accident,
- has exceeded the airspeed or G load limitations,
- made an extremely hard landing,
- used excessive braking action due to aborted takeoffs, long or fast landings, or long taxi runs at high speed,
- flown a sustained flight below 3,000 feet over salt water, a brief entry will be made in the discrepancy block. If known, the cause of the discrepancy and the extent of damage will be included when determined. Responsiblity for making this type of entry will rest with the individual having initial knowledge of the occurrence. These entries are required to assure that adequate inspections of affected systems or components are made t prevent or reduce the possibility o future accidents. The entries will b made upon occurrence of any of th conditions enumerated above regardless of the apparent conditio of the aircraft.

Repeat discrepancies will be identified by entering in red "REPEAT" in the discrepancy block.

Symbology

RED X. A red X indicates that the weapon system or support system is considered unsafe or unf for flight and that the weapon system will not be flown until the unsatisfactory condition is correct No one will authorize or direct an aircraft to be flown until the red X is properly cleared. When the red has been applied, inspection of th work performed to correct the discrepancy and the accomplishme of an audit of all related entries involved for completeness and accuracy are required by maintenance personnel authorized clear a red X condition. This mea to aircrews that two maintenance signatures are needed to sign off a red X.

CIRCLED RED X. A red X inside a red circle will be used to indicate that an aircraft is grounde pending compliance with an urgen action TCTO.

RED DASH. The red dash indicates that a required maintena action, scheduled inspection, spec inspection, time change item replacement, oil sample, operatio

e's a form in your future. And your future
nt well depend on how well you take care of that form.
, your attention to the form can influence someone else's future.
form is the Maintenance Deficiency/Work Record, better known as the
O 781A. If you do a good job filling in the right information,
ntenance will have a better shot at giving you a good airplane.

or functional check flight) which is due has not been leted.

This symbol is used to indicate he condition of the equipment known and a more serious tion may exist. The red dash tion will be corrected as soon ssible by performing the red inspection, time change replacement, operational check, or necessary maintenance.

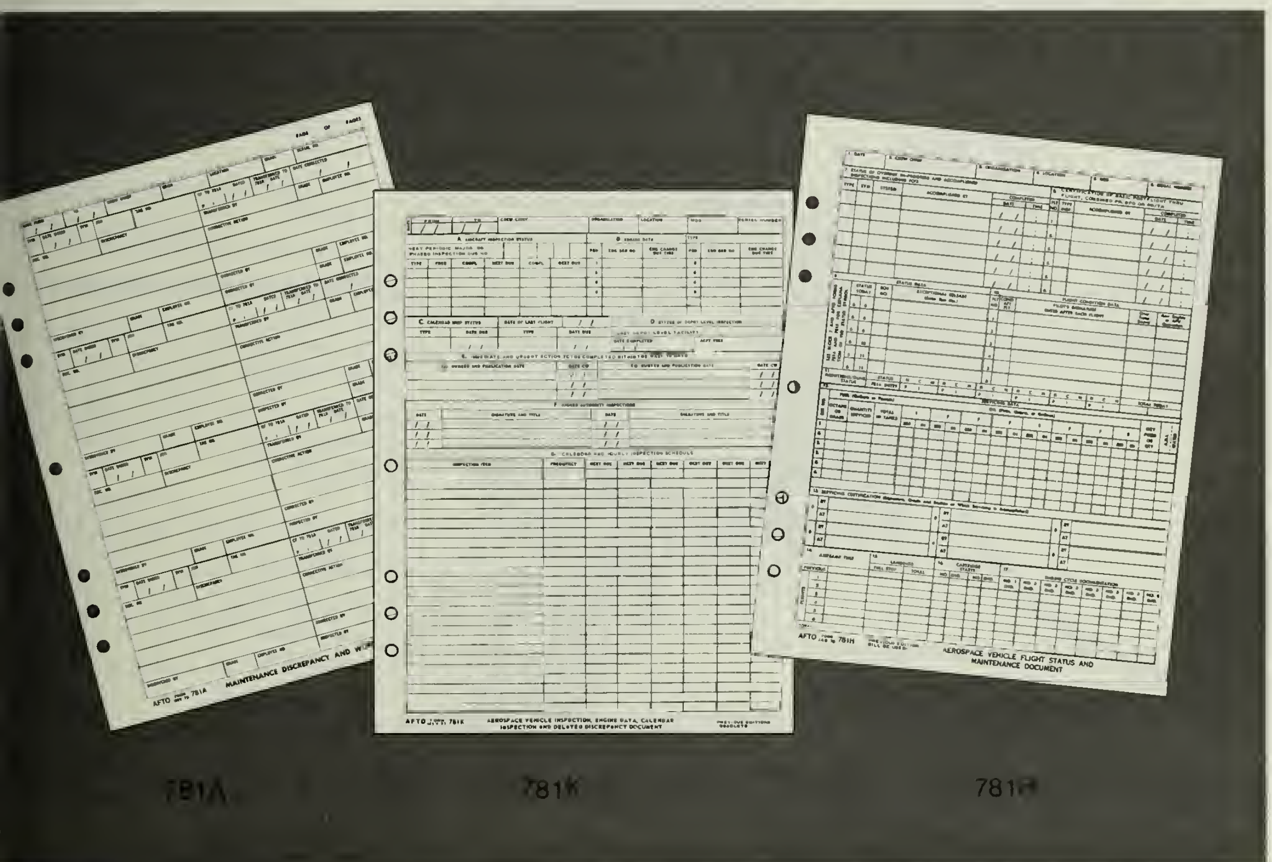
Time change items, other than ustaining items, continued in eyond their scheduled cement will be carried on a red dash until upgraded to a red X. Use of the red dash symbol will begin at the hourly postflight, minor, phase, periodic or major inspection nearest to the replacement due time.

RED DIAGONAL. The red diagonal indicates that an unsatisfactory condition exists on the aircraft or equipment; but, is not sufficiently urgent or dangerous to warrant grounding of the aircraft or discontinuing use of the equipment.

CIRCLED RED N, CIRCLED RED B, and CIRCLED RED C. The red letters N (Nuclear), B (Biological), or C (Chemical) inside a red circle indicate that an aircraft has been or is suspected to have been contaminated with a nuclear, biological, or chemical contaminant.

Hip pocket write-ups don't really do anyone any good. Get them down on the 781A. *Don't forget to transfer red X's in the log at the back of the forms. The history of red X's is for you, the aircrew. Since you fly the aircraft, you have the right to know what's been wrong with it. You also have the responsiblity to pass along this info to the next crew. ■

*Test program at Seymour Johnson AFB, NC.



SURVIVAL: May Be A Snare

By SSgt. JAMES E. MARISCH • Arctic Survival Training • Det 1, 3636 CCTW (ATC) • Eielson AFB, AK

■ The thought of ripping the entrails from a rat or field mouse, plunging him in boiling water, and calling it supper or breakfast, does not appeal to many people. When our survival may depend on wild animal flesh we would like to simply walk up to a deer, elk, or moose, bash its skull with an axe and drag the carcass back to camp for filet mignon, and prime rib dinners. However, not many of God's creatures are going to stand still while the survivor strolls up and tries to terminate their existence. Granted, there are a few unfortunate creatures who possess little or no intelligence, but they are few and far between.

Whether you are running through waist deep snow in 40 below temperatures chasing snowshoe hares, or sprinting along in ankl deep sand in 120 degree heat chasing kangaroo rats, the surviv as he is lying on the ground gasp for breath, will soon realize ther must be an easier way to catch animals. The easier way is guns. But seldom does a survivor have good weapon. What the survivor does have are traps and snares w work 24 hours a day, thereby making it much easier to obtain animals.

The first requirement for a tra snare is simplicity. The more working parts or functions, the greater the chance of failure. On the simplest snares is a simple lo snare, a loop made of small wire string, rope, or any flexible mat (Figure 1).

Tie a very small loop in the e of your material, then pass the o end of the material through the l and you have constructed a simp loop snare. The size of the loop strength of the material should match the head size and strength the animal (Figure 2).

Most survivors should concent their efforts on small game, bird rabbits, squirrels, marmots, etc.

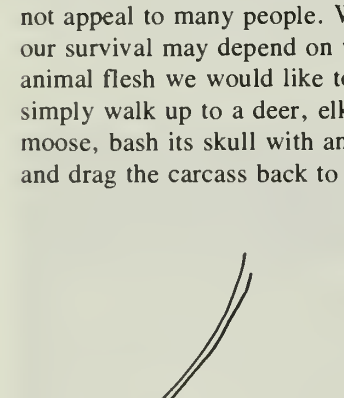


Figure 1

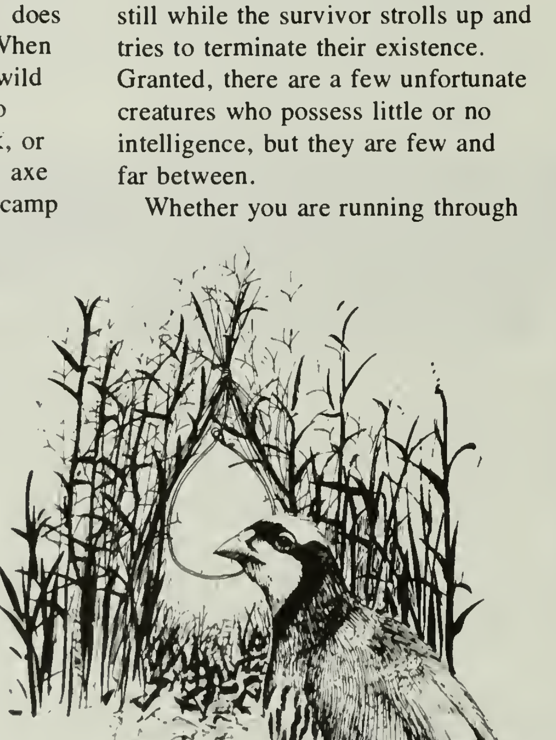


Figure 2

er animals, such as deer, elk, se, and caribou can be taken, extreme caution should be used. e predators, such as bears and nbers of the cat family, should eft alone. Large predators can e severe trauma to the survivor are very adept at killing. No ivor needs to spend long hours ring shredded flesh or splinting en bones. Dangerous animals ld be avoided.

nce you've determined what al you wish to catch, locate an with an abundance of signs, droppings, and tracks. Look for s of high use or trails which the highest concentration of

najority of people take ing for granted

ks and droppings. One set of s out across the lone prairie is good trail. Trails tend to nder through dense areas of tation. Find a spot where the is the narrowest.

e your snare so it hangs in the lle of the trail. Adjust the height the ground so the bottom of nare will hit the animal's legs above the knees, i.e., rabbit to 2″, squirrel 1″, deer 1½′ to oyote 10″, etc. (Figure 3).

st the loop so it's slightly larger the animal's head. Outline with l twigs or pieces of vegetation to help conceal the snare, and place small branches on the sides of the snare to keep animals from going around it (Figure 4). When you are finished with the snare, step back and look at it, and make sure the area looks reasonably undisturbed. If so, good; if not, fix it. There is not a great abundance of suicidal animals in the wild, so your snare should look natural or your efforts may be futile.

Set out as many snares as possible and check them daily. The more you set out, the better your chances of procuring an animal. If, upon checking your snare, you find that you have outwitted some creature and caught it, this should prove that the snare was set effectively.

Once creatures are captured, they must be collected quickly to avoid possible loss to a predator. If the animal is dead, simply remove and reset your snare. If the animal is alive, kill it. This is best accomplished by placing a fairly stout piece of wood very vigorously between the eyes of the creature. This results in a very quick and humane death.

A majority of people take eating for granted. They just run to the chow hall, stores, or restaurants whenever they get hungry. However, when you are in a survival situation and see a lizard run by, or find rabbit and deer tracks everywhere, you'll soon realize that those animals are your breakfast, lunch, and dinner. You can't run them down and they are not going to surrender, so your only hope of eating may be a simple loop snare which can be extremely effective tool for your survival. ■

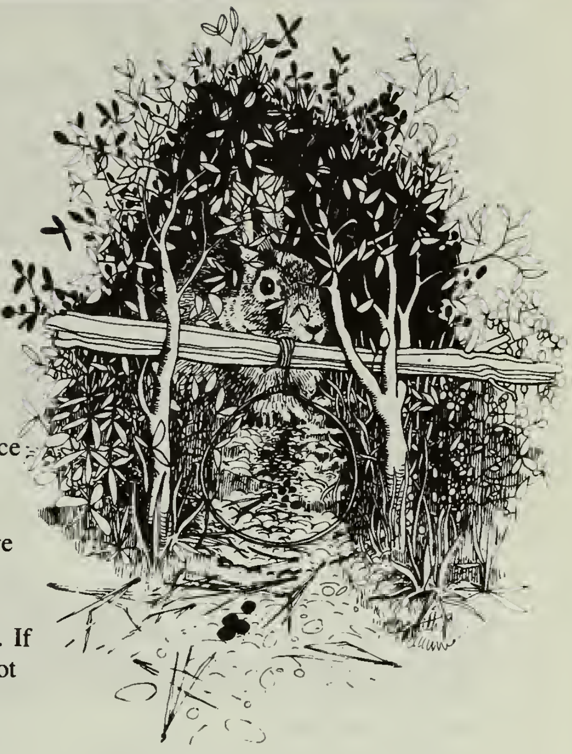


Figure 3

Figure 4

MSAW--Pilot's Friend

By SMSgt MARSHALL E. HOLMAN
Hazardous Air Traffic Report Analyst
Directorate of Aerospace Safety

■ Federal Aviation Regulations place responsibility for safe altitude management on the pilot. However, there is a function of the Federal Aviation Administration's (FAA) programmable automated radar terminal system (ARTS III) that assists air traffic controllers in detecting aircraft that are within or are approaching unsafe proximity to terrain or obstacles. This function is called Minimum Safe Altitude Warning (MSAW).

Those pilots who are not familiar with this program may ask, "How do I participate?" Very easily, indeed! Aircraft on an IFR flight plan that are equipped with an operating altitude encoding transponder, participate by asking the controller. Example: "Los Angeles Center, (call sign) request MSAW." However, it must be remembered, participating in the MSAW program does not relieve the pilot of the responsibility for safe altitude management.

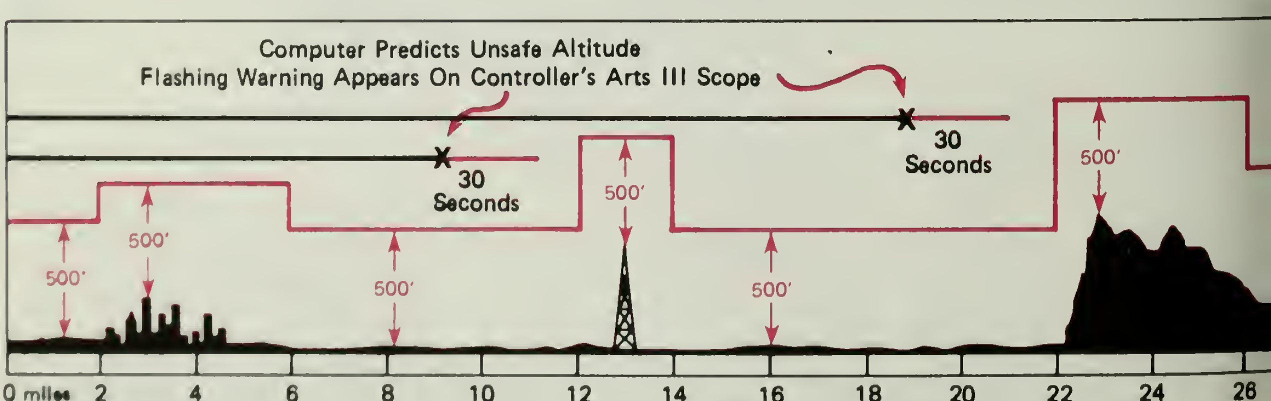
Here is a brief functional description of how MSAW works. For general terrain altitude monitoring, MSAW maintains a computerized grid map of the terminal area. The grid map is comprised of 2-mile squares. The highest known obstacle in each grid or bin determines the minimum safe altitude for that location. The minimum safe altitude is 500 feet above the highest terrain/obstacle in each bin. The ARTS computer compares the current Mode C altitude of an aircraft against the minimum safe altitude. It then looks ahead 30 seconds to see if the aircraft will enter a bin below the minimum safe altitude if it continues its present heading, altitude or rate of climb/descent. Then, the program assumes a 5-degree climb and computes to see if the aircraft will remain above the minimum safe altitude if it were to start climbing immediately. For the look ahead, a buffer of 300 feet, instead of 500 feet, above the highest obstacle is used.

MSAW monitors the final approach course from the final approach fix to a point approximately 2 miles from the landing threshold. It first checks 100 feet below the minimum descent altitude (MDA)/step-down fix altitude. Then it looks ahead dow final using the computer establish descent rate to determine if the aircraft will be 200 feet below the MDA/stepdown fix altitude in 15 seconds.

The computer alerts the control if an aircraft is, or is predicted to be, below a minimum safe altitud by displaying "LA" in the aircra data tag on the radar scope. Also, aural alarm is sounded to attract t controller's attention. The control will then evaluate the situation an if appropriate, issue a radar safety advisory; e.g., "LOW ALTITUD ALERT, CHECK YOUR ALTITUDE IMMEDIATELY."

There are situations, however, under which the controller will no receive an MSAW alert; therefore he may not be aware of the condition. Situations include:

- ATC radar beacon interrogat not operating.
- The ARTS III computer with MSAW program not operating.
- The aircraft not being tracked the ARTS III.
- The aircraft's Mode A or Mo



nsponder sending garbled, weak
roneous signals. (Both Mode A
Mode C signals are required for
W processing.)
The aircraft not within radar
rage because it is below line of
or too far away from the radar

A departing aircraft within 3
of the airport, or an arrival on
approach to an instrument
ay and within 2 miles of the
rt or between the stepdown fix
he airport. (Because of the
us types of activity in an
rt traffic area it is not currently
cal to continue MSAW
ssing within these areas.)
The aircraft has been inhibited
computer processing for low
de alerts. (Aircraft are
times purposely operated at low
des. MSAW processing of
flights will be inhibited
se the controller would receive
nuous alerts [false alarms]
ng the intentionally low flying
pilot to be unnecessarily
ed to check his altitude.)
e to radar antenna rotation
the computer needs about 10
ds to establish a definite course
r altitude change.
equently, there are two
tions that may result in low
de alerts being issued too late
rmit the pilot to take corrective
n. These are:
aircraft's projected track is of any known obstacle and rupt turn is made toward

aircraft operating at an de just above the rammed MSAW makes an pt descent.
member, when a pilot receives
altitude alert advisory from a
oller, it is the pilot's
nsibility to evaluate the
ion and determine what action
be necessary. Also, the pilot is
cted to inform the controller
diately should any action be
after receiving the radar safety
ory. ■

Request Avoidance Vectors

By SMSgt MARSHALL E. HOLMAN
Hazardous Air Traffic Report Analyst
Directorate of Aerospace Safety

■ A recent near midair collision between a flight of four F-105's and a Bonanza near Tinker AFB emphasizes the need for all pilots to fully understand the availability of "additional" air traffic control services.

The flight of F-105s, climbing on a SID from Tinker AFB, was issued traffic at "11 to 12 o'clock, 10 miles, altitude unknown." As the flight was climbing through 5,500 feet MSL, a Bonanza was sighted, and the flight lead directed the aircraft on his left to stay low. A collision was narrowly avoided as the Bonanza passed slightly above and about 30-40 feet to the left. The Bonanza, which was not in contact with air traffic control, was observed to lose some altitude as it encountered the jet wash.

This near miss possibly could have been avoided if the flight had asked for and received avoidance vectors from the controller when the traffic was not immediately sighted.

The primary purpose of the air traffic control system is to prevent a collision between aircraft *operating in the system.* In this case, the Bonanza was not a participant in the system. Thus, according to air traffic control procedures, the F-105 pilot would have to request the avoidance vectors. When received by the controller, the request would have been treated as an additional service (third priority duty) and factors such as limitations of the radar, volume of traffic, frequency congestion, and controller workload would have determined the controller's ability to handle the request. However, it is highly likely that the request would have been honored.

Missing another aircraft by 30-40 feet, at 350 KIAS, while in formation flight, should be enough incentive for any pilot to request any air traffic control service the next time. Fortunately, for these crews, there will be a next time. ■

Residual Effects Of Alcohol On Aircrew Performance

By LEON M. WISE, Ph.D.
Heidelberg College
Tiffin, Ohio

■ Many of the immediate effects of alcohol ingestion are well known and well documented. Hundreds of studies have been done over the years which point to specific negative effects on such things as reaction/response time, vestibular functioning, coordination, judgment, memory, decision-making, risk taking, and a host of others.

Our laboratory, among others, has periodically undertaken studies to examine some of these factors in an aviation environment. The findings not only substantiate these obvious alcohol effects but also have brought out the increased significance of such effects on a highly complex high risk task like flying a high performance vehicle in a hostile environment (1, 2, 8, 9, 15).

It is well known that drinking and driving a car is dangerous. Flying after drinking magnifies this danger potential. A comparison of automobile driving with flying may help to make this clear.

It is not uncommon to overhear an instructor pilot say to a prospective student, "Flying is as easy as driving a car." This is just not true! Controllable car motion does not have as many degrees of freedom as an airplane. The automobile driver controls left and right movement (yaw) only. An airplane pilot, on the other hand, not only uses a control for yaw but for pitch and roll as well. In addition, a pilot frequently, if not usually, controls all three of these axes at the same time in an attempt at well coordinated movement.

The speed of automobiles on the open road is presumed to be somewhere around the legal limit, 55 mph. Airplane pilots normally cruise at three figure airspeeds or more so that closing distances as a function of time happen much faster than in a car.

If the driver in a car drops a cigarette, loses his map, or spills a beverage, he can, if he chooses, pull over to the side of the road and retrieve the object or clean up the mess. If he is tired or a bit too relaxed because of the couple of drinks he had toasting the bride and groom at a wedding reception, he can pull over and rest. A solo pilot does not have that option. Once airborn, he must fly on until he reaches his destination. In sum airplane is more complicated than a car and flyin more demanding than driving.

A few years ago we conducted an experiment to what effects alcohol might have on the general respo involved in a simple flying task (13). We gave col students, who had been practiced in a jet instrument tra (Figure 1), enough vodka and gingerale to be the equ lent of approximately a .08% blood alcohol level. was significantly below the limit established by the S of Ohio for legal driving (.10%). Thirty minutes late asked them to fly a very simple profile. They were structed to begin with the preflight checklist, cont through the run-up, taxi to the active runway, take climb to 5,000 feet and level off. They were to main this altitude until notified otherwise. Some of the haviors exhibited during the study included: inco wing flap settings for takeoff and landing, accidental dumping by selecting the incorrect switch, dropping landing gear well in excess of placarded speeds, atte to land by instruments at 10,000 feet above ground (misreading the altimeter by 10,000 feet), forge checklist items or performing them out of sync, an one case literally falling into the cockpit! And all of while legally sober. That is, sober enough to legally a car!

Since most people who drink socially do so in evening, we followed this study with a night-flight ve (Figure 2). We found not only that our subjects (Ss) c mitted the same types of mistakes but were much likely to act as though their visual apparatus had constricted to a kind of tunnel vision with thinkin match. They were also unable to handle routine e gencies in an appropriate and timely fashion (14). replicated these studies with some variations and f that data to be in general agreement in both cases.

The old World War II image of the hot-shot pilo cluded flying the hairy mission, making it safely to h base, and then repairing to the local bar to hoist a few

1. Subject in single engine jet simulator.

2. Subject dark adapting while waiting for alcohol to become ffective.

swap lies. It was part of the macho image of the day. That image has still not altogether disappeared. Many pilots, like non-pilots, do drink socially and a few drink more than they should. On more than one occasion prior to takeoff a pilot has been observed taking a few whiffs of 100% oxygen to clear out the cobwebs. This suggests that although it had been some time since the last drink, he was suffering from what is commonly known as a hangover—a condition we prefer to call residual or delayed alcohol effects.

A review of the literature on the lasting effects of alcohol ingestion discloses residual effects of alcohol that include changes in epinephrine/norepinephrine secretions (3), plasma testosterone levels (18), metabolic acidosis (19), plasma renin activity and plasma aldosterone levels (10), blood glucose, blood lactate, free fatty acids, and ketone concentrations (20), and, lasting from 14 to 21 hours after drinking. In addition, some studies have reported long lasting residual detrimental effects on such important functions to the pilot as Coriolis stimulation and positional nystagmus (6, 11)—functions important in maintaining equilibrium and correct orientation.

According to FAA regulations, Part 91 (7), only an 8-hour elapsed time is required between drinking and flying. This regulation assumes that detrimental alcohol effects have been effectively dissipated within the 8-hour period.

Because of the discrepancy between this FAA regulation and the reports of residual physiological effects in the literature, we set out to determine what, if any, residual behavioral effects could be observed when alcohol ingestion was combined with a fairly simple flight related task—a preflight checklist situation. More specifically, we were interested in comparing a no-alcohol condition with a 30 minute post-alcohol condition with a 14 hour post-ingestion condition. In this study, reported elsewhere (16), oversight errors were used as a measure of alcohol effects. For example, before each S entered the simulator cockpit, the experimenter preset the following errors.

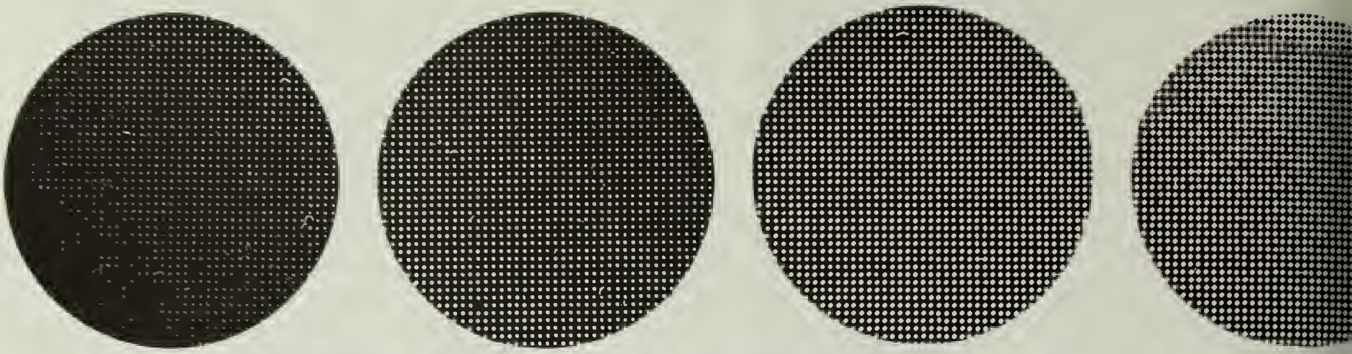
The landing gear handle was placed in the UP position. If a pilot takes off in this condition and in this particular simulated aircraft, as soon as a significant amount of weight has been removed from the wheels, they retract automatically. Result? A good chance that the plane would settle back down on the runway and onto its belly.

The dive flap or speed brake switch was placed in the DOWN or extended position. This means that as soon as hydraulic pressure reaches the proper level they will extend and remain extended. Takeoff would have been extremely difficult, if not impossible.

Wing flaps were set at the 50% position. This would create excess drag and cause some difficulty on takeoff.

The fuel selector switch was a three-pole, double-throw, center-off switch by which the pilot could select

☞



Residual Effects Of Alcohol On Aircrew Performance continued

TIP TANKS, OFF, or MAIN TANKS. For the experiment, the fuel selector switch was placed on tip tanks. This meant that after lift-off if the pilot tried to change the fuel switch by moving it one click (detent) in the proper direction, he would actually place it in the OFF position. Obviously, this would result in premature fuel starvation, probably on climbout.

The parking brakes were left off. If the pilot overlooked this, the aircraft would begin to move shortly after the throttle was placed in the IDLE position and the engine spooled-up. This action might easily bring about contact with other aircraft or support vehicles parked nearby at the very least resulting in "ding-damage."

Finally, the altimeter was misset by 1,000 feet. If not caught prior to attempting an instrument landing, the pilot, without realizing it, would actually be trying to put the aircraft 1,000 feet below the surface of the runway!

The results were very enlightening. In spite of the fact that all traces of alcohol were probably gone from the blood 14 hours after drinking, our results indicated a definite detrimental effect on the preflight task.

It is obvious that these misset errors hold considerable danger for the unsuspecting pilot. However, in this study if the Ss had carefully followed the checklist, they would have caught each and every one of them. This, unfortunately, was not the case. Fourteen hours after drinking, approximately 68% of all Ss missed at least one preset error as compared with 10% for the no-alcohol condition and 89% for the 30 minute post-alcohol condition. In fact, responses after 14 hours were much more like those 30 minutes after drinking than they were like those under the no-alcohol condition. The Ss did not anticipate errors, so they found none.

The results appear to speak for themselves. The residual effects of alcohol produced a significant number of oversight errors. How to explain this is another matter.

We can assume that all traces of alcohol were absent from the blood by the time the Ss were tested in the 14 hour post-ingestion condition. Therefore, it had to be something other than a direct alcohol effect. Alcohol produces significant changes in the body systems, as was pointed out earlier. These changes appear to rema long after the alcohol itself has been metabolized a may produce, in some as yet unknown way, alteratio in behavior. Perhaps with time, the body readjust eventually returning to something resembling its norm state.

Conclusions

What conclusions may we legitimately draw from of this? Obviously, we cannot discount the residu effects found in the study described above. Further, th suggests that the same phenomenon may be occurring other related conditions, e.g., military, air carrier, a general aviation flying but because of the less obviou more subtle nature of residual effects, is not readi overtly observable. Beyond this we must be careful n to generalize too far afield. However, based on our fin ings it is suggested that the same thing may well be ha pening in many, if not most, industrial settings wherev man and machine are mated. In support of this thinkin one study (17) has reported detrimental effects on su industrial type tasks as eye/hand coordination and po tioning for up to 18 hours after drinking. This is esp cially relevant to so-called high risk tasks where a slig error of judgment or miscalculation might be catastroph for the individual worker and very costly to the indust itself.

Unfortunately at this point in time, we really dor know what proportion of industrial accidents or airpla crashes are caused partly or fully by this residual effe of alcohol because of its latent nature.

On the positive side, however, the FAA (4, 5, 1 has already begun a series of studies reevaluationg th 8-hour rule. More are anticipated. Notwithstanding th effort, thorough studies, particularly in realistic setting are strongly urged on air carriers and military air arm and, it is essential that such an important factor as resid al alcohol effects be intensively studied in a wide varie of industrial man-machine situations and systems. ■

rences

illings, C.E., Wick, Jr. R.L., Gerke, R.J., and Chase, R.C. ne effects of alcohol on performance during instrument ght. FAA Office of Aviation Medicine *Report No. 72-4*, 972.

illings, C.E., Wick, Jr. R.L., Gerke, R.J., and Chase, R.C. ffects of ethyl alcohol on pilot performance. Aerospace edicine, *44*: 379-382, 1973.

rohult, J., Levi L., and Reichard, H. Urinary excretion of drenal hormones in man, effects of ethanol ingestion, and eir modification by chlormethiazole. Acta med. scand. *38*: 5-13, 1970, (Abstract).

olline, W.E., Performance effects of alcohol intoxication nd hangover at ground level and at simulated altitude. FAA ffice of Aviation Medicine *Report No. 79-26*, 1979.

olline, W.E. and Chiles, W.D. Laboratory performance uring acute intoxication and hangover. FAA Office of viation Medicine *Report No. 79-7*, 1979.

owd, P.J. Influence of alcoholic beverages on the esitbul-ocular responses to coriolis stimulation. Quarterly ournal of Studies on Alcohol, *35(3-A)*, 943-952, 1974.

ederal Aviation Administration. Federal Aviation egulations, Part 91, U.S. Government Printing Office, 975.

enry, P.H., Flueck, J.A., Sanford, J.F., Keiser, H.N., cNee, R.C., Walter III, W.H., Webster, K.H., and artman, B.O., and Lancaster, M.C. Assessment of erformance in a Link GAT-1 flight simulator at three cohol dose levels. Aerospace Medicine, *45(1)*:33-44, 974.

enry, P.H. Fleuch, J.A., and Lancaster, M.C. Laboratory ssessment of pilot performance using non-rated subjects three alcohol dose levels. USAF School of Aerospace edicine, *Technical Report No. 74-27*, 1974.

nkola, J., Fyhrquist, F., Niemmen, N.M., Weber, T.H., nd Tontti, K. Renin-aldosterone axis in ethanol intoxication nd hangover. Europ. J. Clin. Invest. Bull. *6:*191-194, 1976, Abstract).

yback, R.S. and Dowd, P.J. After effects of various coholic beverages on positional nystagmus and coriolis cceleration. Aerospace Medicine, *41(4)*:429-435, 1970.

(12) Schroeder, D.J. and Collins, W.E. Effects of congener and noncongener alcoholic beverages on a clinical ataxia test battery. FAA Office of Aviation Medicine *Report No. 79-9*, 1979.

(13) Wise, L.M. The effects of alcohol on performance in simulated flight. *TAC Attack*, June, 1973.

(14) Wise, L.M. Alcohol effects on a night flight checklist task. Unpublished experiment. Aviation Psychology Lab., Heidelberg College, 1974.

(15) Wise, L.M. Preflight errors as a function of the human condiiton and alcohol. Allegheny Air Lines Flight Crew Quarterly, April, May, June, 1975.

(16) Wise, L.M. Flying the morning after the night before. *United States Army Aviation Digest*, February, 1979.

(17) Wolkenberg, R.C., Gold, C., and Tichauer, E.R. Delayed effects of acute alcoholic intoxication on performance with reference to work safety. Journal of Safety Research, *7*: 10-4-118, 1975.

(18) Ylikahri, R., Huttunen, M., Harkonen, M., and Adlercreutz, H. Hangover and testosterone. Brit. Med. J. 2:445, 1974, (Abstract).

(19) Ylikahri, R. Poso, A.R. Huttunen, M.O., and Hillbom, M.E. Alcohol intoxication and hangover: effects on plasma electrolyte concentrations and acid-base balance. Scand J. Clin, Lab. Invest. *34*:327-336, 1974.

(20) Ylikahri, R.H. Leino, T., Huttunen, M.O., Poso, A.R., Eriksson, C.J.P., and Nikkila, E.A. Effects of fructose and glucose on ethanol-induced metabolic changes and on the intensity of alcohol intoxication and hangover. Europ. J. Clin. Invest. Bull., *6*:93-102, 1976. (Abstract).

ABOUT THE AUTHOR

Leon M. Wise is Chairman of the Psychology Department of the Aviation Psychology Laboratory at Heidelberg College, Tiffin, Ohio. He received his doctorate in experimental psychology from the Pennsylvania State University. He has published articles and research reports in a rather diverse group of publications, e.g., the Journal of Experimental Psychology, *the* Journal of Abnormal and Social Psychology, *the* Journal of Comparative and Physiological Psychology, *the* Psychological Record, *the* Teaching of Psychology *and several others with an applied emphasis. Most of his recent work has been in the field of aviation safety. He is also a consultant in criminal justice and aviation psychology. His initial contact with flying was as an Aviation Cadet in the Army Air Corps during World War II.–Courtesy* Safe Journal, *Summer Quarter–1980.*

letter to rex

■ Here at Downsouth AFB one of our special interest items concerns the coveted Rex Riley Transient Service Award. We want it badly and intend to win it. I won't go into the details of our efforts toward this goal, but believe me, we're expending a lot of time and energy to provide the tops in transient support.

However, the object of this letter, Rex, is not to promote our efforts. We need your assistance in solving a problem which is plaguing not only us, but most likely other bases as well.

Rex, imagine this scenario: An Army C-12 with a general aboard lands and taxis to the parking area. A few minutes later a crew bus— a bus, Rex,— arrives and picks up the general and crew. Shortly afterward, the pilot walks up to Base Ops counter and announces to the shock and dismay of Base Ops personnel that the general has arrived! Not much of a welcome, right? It happened here and unfortunately, the story doesn't end in Base Ops. Not only had the pilot not bothered to ensure word was passed of the general's estimated arrival, he also apparently failed to read the "Welcome" brochure— in which local procedures are outlined— which Base Ops personnel provide transient crews. So, shortly before departure, instead of paying for coffee and flight lunches at our "One Stop" area in Base Ops, he walked to the flight kitchen, paid the bill and decided to walk back to his aircraft. Had he read the brochure he also would have learned that you don't enter the flight line at just any point on the ramp. There are clearly defined entry points and roped off restricted areas. As you might guess, the pilot walked into one of the restricted areas. That's when Security Police came into the picture. The pilot was quickly apprehended in what was rapidly becoming an embarrassing situation for pilot and general alike.

By the time the general's trip to Downsouth AFB was completed, he had, to say the least, become somewhat frustrated at the series of events which had occurred. And rightly so!

The bottom line to this, Rex, is that bases need some degree of cooperation from aircrews in order to provide good transient service. Granted, in the case just mentioned, the flight service station should have forwarded the DV information contained in the remarks section of the flight plan; but we all know— or should— that this doesn't always occur. There are additional methods to pass along such information— and receive acknowledgement of receipt. For example, a radio call to the Base Ops dispatcher or command post prior to landing— or even to ground control after landing if all else fails. Of course, when calls are made to other than Base Ops, pilots should request that the information be passed to Base Ops. Frankly, if I were flying a DV around, I'd probably use a of the above methods. After all, who wants to fly back home wit an upset general?

You know, Rex, facility commanders can do everything their power to provide excellent transient service but their efforts may fall as flat as last Saturday night's beer unless aircrews als make an effort to help themselv and their passengers. And whe this occurs, the base often look bad even though that may not b where the fault lies.

Well, Rex, thanks for listenin and providing the opportunity to pass this info on to the aircrews By the way, if you should find yourself on the road, you're welcome to drop in. Our troops here are friendly and professio and you'll find this a beautiful p of our country, especially durin the spring months. We look forward to your next visit.

Hope to see you soon.

Chairman,
Rex Riley Award Committe

Dear Chairman

We couldn't have said it bett Transient crews have no gripe coming if they don't make an effort to let the destination kno about special requirements–b they VIP, fuel, cargo, parking, drag chute, etc. About the ram security/entry problem–we've kind of passed the word to TA folks to remind crews of acces points as they deplane. That c save a lot of delay and embarrassment. Thanks for the story. We'll stop by! ■

Safety First...Last...and Always

ot too far back in the history of the working an—about 90-odd years ago—the words afety" and "work" just didn't get along to- ther. Safety, during the brawling clangor of world dustrialization, connoted a prim and elegant ncept better suited to pale young men chatting tearooms than to buckos sweating in the mines, e mills, firing the furnaces that made the wheels 'round.

In those days the only safety a man could get was hat his sinews and skills —and luck—could give m. And when these played out, laddie, that was e way of it.

Yet strangely enough, out of ego, ignorance or th, many of that era's workers developed a sort of rogant pride in their ability to do a good job under rilous conditions—an attitude, incidentally, plauded by owners who considered anything less disloyal, unpatriotic or, even worse, costly.

Turn-of-the-century Welsh miners, for example, garded askance one enlightened owner's attempt better their lot by equipping them with a "safe- pour helmet"—the prototype of today's hardhat that, ironically, has become the symbol of work- man machismo.

A local gazette reported the miners' reaction: "... many of the colliers forthrightly eschewed the headpiece, one pit-fellow even likening it to a chamberpot better put to other ends."

But safety procedures weren't always considered an affectation. Not by a millenia. In fact, safety engineering can trace its conceptual roots to Greek antiquity: to Daedalus who not only invented man's first wings but who also originated the safety specs in how to use them properly.

The wings were made of feathers and wax, mate- rials that more or less limited flight to a safe zone— the "middle air" between sun and sea. Too high and the wax would melt in the sun; too low and spray-soaked feathers would drag the craft into the sea. Daedalus, as the design engineer, knew the limitation of his construction; as history's first flight safety analyst, he developed a plan that would circumvent the flight's hazards—a proce- dure he stipulated to son Icarus, the soon-to-be mourned flyer. ☞

Everyone knows the story's end. Icarus violated the flight plan and flew too high; his fall from grace gave birth to the venerable Greek maxim: "Next time listen to your poppa!" Daedalus' admonitions were perhaps the first application of a discipline we mortals now call system safety engineering — a case history that reveals why industry now recognizes that the functions of the design engineer and the safety engineer are inseparable.

The importance of safety engineering is no myth. It's as real as the "eject" button on a fighter's display panel. The aerospace industry, in particular, has cocked an increasingly attentive ear to safety engineering in the last twenty years — due in large part to the increasing insistence of the military services.

Safety experts agree that this increasing awareness is due to the abandonment of the belief that people were to blame for most accidents. In the '30s, it was thought that 85 per cent of all accidents were caused by careless actions, as opposed to unsafe conditions. More recent studies have shown the percentage of accidents attributable to carelessness is closer to 25 per cent.

Ironically, it was the advent of unmanned systems, such as missiles, that helped cause this shift in philosophy. With accidents involving aircraft, the tendency was to blame the pilot. But when missiles became part of the flight inventory, their malfunctions could no longer be blamed on the pilot; defects in design or manufacturing gradually assumed the villain's role. Armed with this data, the defense agencies started requiring contractors to include programs for system safety as an integral part of hardware design.

Safety engineering received another boost from an unexpected quarter: the courts. Judicial opinion began finding for the plaintiff in cases involving death or injury caused by faulty products, a trend sending shudders through all of industry.

Enter system safety engineering, a discipline that applies innovative analytical and engineering methods to ensure safety in systems design.

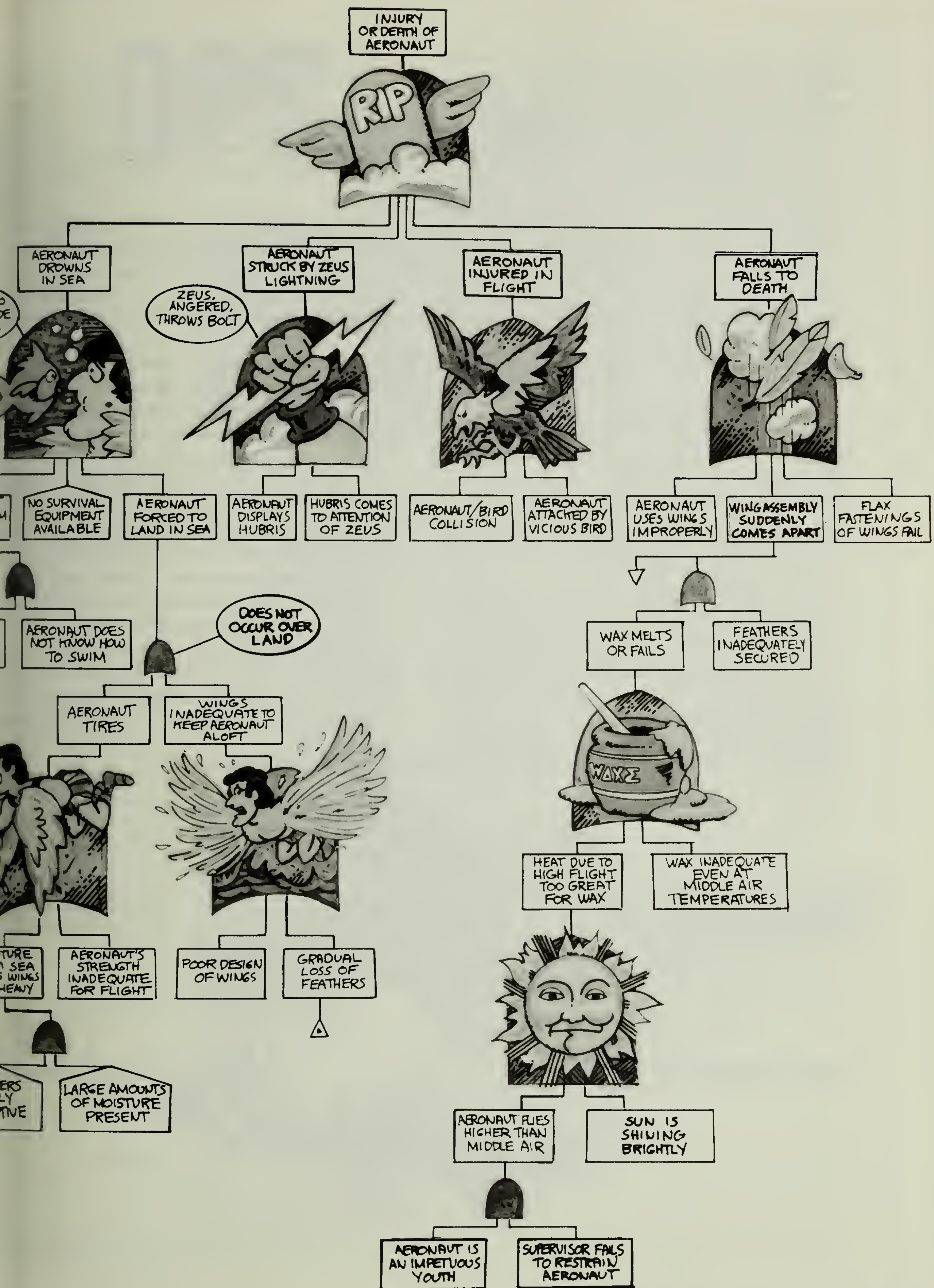
Central to the discipline is the concept that acc dent prevention must begin as soon as the idea for new product or system is conceived. The earlier in the design process that potential hazards are recog nized and controlled, the greater will be th manufacturer's savings in terms of modifying system — or the avoidance of a liability settlemen in a negligence case.

At the heart of system safety engineering is a pr cise analytical technique called Fault Tree Ana ysis. Developed by Bell Laboratories for an Ai Force missile safety program, Fault Tree Analysi uses Boolean Algebra techniques in a manner stri ingly similar to the way electrical engineers us digital logic to design computers.

Like the input/output gates of a computer, eac potentially hazardous situation or event leading u to an accident (such as a valve failing to close exists in one of two states: present or absent. Whe two or more such situations occurring simultan ously lead to another, more precarious situatio they are said to be connected by an AND conditio If, on the other hand, any one of the two or mo lower level events can by itself bring on the mo dangerous situation, an OR condition exists.

Using these basic elements, a safety engine can analyze the causes of accidents by startin with the most disastrous, top-level event, and tr ing his way down the fault tree. And he can als calculate the probabilities of mishaps by usin computer techniques.

Here's how Daedalus might have used Fault Tr Analysis in a safety program for his invention (se diagram). The ultimate catastrophe, "Injury Death of Aeronaut," can be seen to arise from an c condition involving "Aeronaut Drowns in S and "Aeronaut Falls to Death." These events, turn, arise from combinations of other, less ob ous hazardous situations, and so on down to t lowest branches. In this way, even the mo seemingly trivial danger is spelled out in relatic to the overall safety of the system.



INJURY OR DEATH OF AERONAUT
RIP
AERONAUT DROWNS IN SEA
AERONAUT STRUCK BY ZEUS LIGHTNING
ZEUS, ANGERED, THROWS BOLT
AERONAUT INJURED IN FLIGHT
AERONAUT FALLS TO DEATH
NO SURVIVAL EQUIPMENT AVAILABLE
AERONAUT FORCED TO LAND IN SEA
AERONAUT DISPLAYS HUBRIS
HUBRIS COMES TO ATTENTION OF ZEUS
AERONAUT/BIRD COLLISION
AERONAUT ATTACKED BY VICIOUS BIRD
AERONAUT USES WINGS IMPROPERLY
WING ASSEMBLY SUDDENLY COMES APART
FLAX FASTENINGS OF WINGS FAIL
AERONAUT DOES NOT KNOW HOW TO SWIM
DOES NOT OCCUR OVER LAND
WAX MELTS OR FAILS
FEATHERS INADEQUATELY SECURED
AERONAUT TIRES
WINGS INADEQUATE TO KEEP AERONAUT ALOFT
WAXΣ
HEAT DUE TO HIGH FLIGHT TOO GREAT FOR WAX
WAX INADEQUATE EVEN AT MIDDLE AIR TEMPERATURES
AERONAUT'S STRENGTH INADEQUATE FOR FLIGHT
POOR DESIGN OF WINGS
GRADUAL LOSS OF FEATHERS
LARGE AMOUNTS OF MOISTURE PRESENT
AERONAUT FLIES HIGHER THAN MIDDLE AIR
SUN IS SHINING BRIGHTLY
AERONAUT IS AN IMPETUOUS YOUTH
SUPERVISOR FAILS TO RESTRAIN AERONAUT

Other, less mathematical methods also contribute to a sound system safety program: Failure Modes and Effects Analysis, which scrutinizes the effects of hardware failures; Contingency Analysis, which provides emergency measures to cope with any hazard that cannot be eliminated; and Procedures Analysis, which examines the effects of human errors.

This last category is vitally important since the performance of the human operator of any system is the most unpredictable element. Often, accidents attributed to human error were in part caused by the designers' failure to adequately consider human factors involved in the operation of the system.

For instance, safety officials investigating an airliner crash determined the probable cause of the accident was the pilot's failure to accurately monitor his fuel supply. However, the examiners noted that the design of the fuel gauges — which required the pilot to multiply by one of two different scale factors — may have contributed to the confusion that led to the ultimate error.

At Hughes Aircraft Company, every system under development includes system safety as an important element of overall logistics support.

The Maintainability and System Safety organization of Hughes shoulders most of the responsibility for not only implementing system safety programs but ensuring that the personnel are properly trained as well.

Just as Daedalus alerted Icarus to importan safety considerations in operating his wings o feathers and beeswax, Hughes safety engineer meet with design engineers involved with al phases of development of systems — includin flight control systems for the U.S. Navy and Ai Force.

Far more complex than feathers, today's fligh systems pose potential safety problems Daedalu could never have envisioned. High voltages, torri temperatures, intense pressures, lethal lasers — al of these, singly and in combination, are metic lously analyzed by safety engineers working i concert with designers at every stage of system development.

Fortunately, the significant safety hazards inhe ent in each system have been automaticall eliminated by a series of interlocks built into th system, designed to prevent dangers from croppin up in the first place. Still, the need for instructin the services' modern-day Icaruses in safety me sures cannot be sold short. It's just one more aspec of a safety program that starts before the system i designed and continues throughout its lifetime.

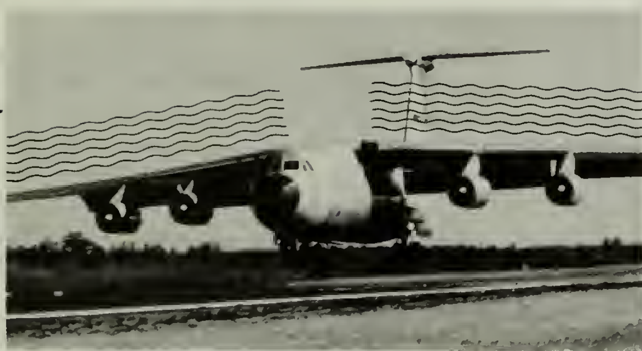
A safe system and an operator schooled in its saf operation have finally brought the words "safet and "work" where they belong — together. And i there are any "safety-eschewing" miners aroun who doubt it, let them remember what happene to Icarus.

Courtesy Vectors mag
Vol XXII, Sprin
Hughes Aircraft Co., Culver City, Cal

OPS topics

e Turbulence

ake turbulence still its ugly head from to-time. An F-106B discovered this when anded abput two min- after a KC-135 had a low approach. In are the '106 developed n sink rate and power advanced for go nd. But the aircraft ed down hard 500 feet the runway. Control naintained and the air- stopped; however, was considerable ge to the aft fuselage, e shroud and the tail release mechanism. wind pattern was such the KC's vortices d hold on the runway h led to speculation he mishap was caused ake turbulence. A few earlier a B-52 en- ered wake turbulence g a MITO. The left ear and tank struck the ay. Pilots should al- be aware of potential turbulence and be ared to take necessary er action.



Vibrating Nose Gear

At 20 - 40 kts on takeoff roll, a C-141 began lateral vibrations that became so severe the pilots could not keep their feet on the rudder pedals and were unable to use the brakes. The aircraft was stopped with reverse thrust. The problem was a disconnected scissors assembly. The aircraft had been towed by maintenance which disconnected the scissors. When the crew arrived at the aircraft the 781 indicated the scissors was reconnected and signed off. The assembly stayed attached through four turns but apparently disconnected during takeoff roll.

Controls Binding

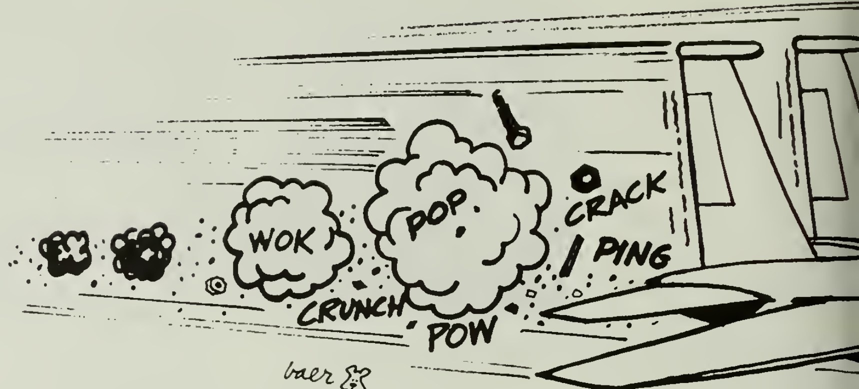
An F-4D crew had their hands full when the stick bound and could not be moved forward. The flight was an FCF after extensive lateral control system maintenance. In a climb, as airspeed decreased through 250 kts, the pilot attempted to unload, but the stick wouldn't go forward. Both crewmembers pushed to no avail. Recovery from their 30 degrees nose high was by rudder. During RTB, repeated attempts to overcome the problem failed. The decision was to land at 200 kts with no flaps. After touchdown, as the aircraft crossed the BAK-13, the stick broke loose. Preliminary investigation indicated an aero 7A umbilical dust cover had lodged on the stabilator bellcrank. If that turns out to be the case, it won't be a first. Same thing has happened before.

Wrong Field

What do you do if you are a tower controller and see a light twin aircraft approach the field at about 500 AGL, fly through the pattern, cross the field outbound on final approach to 4 DME, then turn inbound on final to the runway? After other attempts to contact the aircraft failed, an alert controller at Williams AFB got the pilot on a nearby civilian field frequency and instructed him to depart the airport traffic area. The aircraft was on a cross country, and the pilot simply mistook Williams for nearby Falcon Field. A similar event occurred within days at MacDill AFB when a light plane was on final for Rwy 36 at MacDill and thought it was Tampa. These don't happen every day, but they are frequent enough to remind us that despite the many nav aids we have, some people don't, or won't, use them. So stay alert—both controllers and aircrews. ■

Don't Crash Engage Your JFS

By GALEN STANLEY
Senior Systems Safety Engineer
McDonnell Aircraft Company



■ **". . . During first engine start, the JFS engaged normally, accelerated through 50%, disengaged, and returned to idle. The engine stagnated and the pilot noticed the FTIT climbing through 600 degrees as the rpm decayed through 45%. He immediately raised the fingerlift and pulled the throttle to off. As he did, the JFS accelerated and the CGB re-engaged the decelerating engine. The rpm and FTIT drooped to zero while the JFS continued to run at 100%. The JFS switch was placed in the 'off' position, and the aircraft ground aborted. Investigation revealed the CGB stub shaft had failed at its designed shear section. . . ."**

As you read the above excerpt from a recent report, how many of you asked yourselves if this could also happen during an attempted *inflight* JFS-assisted *restart*? Well unfortunately it can, so let's see why this potential problem exists.

It Works Like This

To fully understand how you can get into this fix, a brief description of the engine start circuitry on aircraft with Air-Operable JFS capability is needed. I'll only talk about the right engine circuit to avoid confusion, but the left engine circuit is the same as far as this situation is concerned.

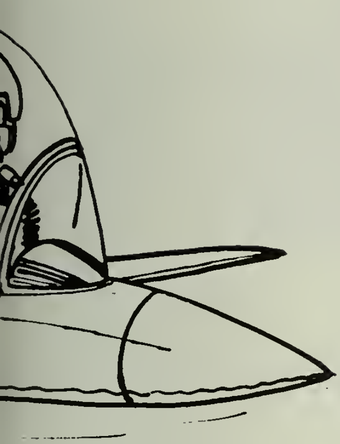
When the right master switch is ON, power is provided to the right engine start switch (actuated by the fingerlift), whenever the rpm is below approximately 50%. Momentarily actuating the start switch (lifting and releasing the fingerlift) will energize the right AMAD select relay, designating the right AMAD/engine to be engaged by the JFS. By the way, the left and right select relays cannot both be energized at the same time; and once one of the relays is energized, it will remain energized until the rpm exceeds 50% or the master switch is cycled or turned completely off. To illustrate the point, if you were starting with external power, you could lift and release one of the fingerlifts before starting the JFS, and then during JFS start, the corresponding AMAD/engine would engage automatically once the JFS reached the proper operating speed and pressures.

There I Was . . .

The Flight Manual emphasiz importance of attempting/ considering normal inflight rest before attempting a JFS-assiste airstart during a dual engine ou situation. Suppose you follow t book's advice, have no luck an decide to shut down and attemp JFS-assisted airstart. The net r is that you have had two opportunities to inadvertently e the start circuit while shutting the engine. If during either shutdown, the fingerlift was he full up while moving to the ful off position you will get some of inadvertent or out-of-sequen engagement. Let's look at the possibilities.

If the engine start circuitry h previously been activated, the when started, will immediately engage and attempt to accelera engine. If the engine rpm is be 30%, the engagement should b normal and not result in any problem.

If the start circuit is already energized and the engine rpm i above 30% when you start the you stand a good chance of sh the CGB stub shaft. This is als



inadvertently actuate the start while shutting down the : with rpm above 30% and the ready running. In either case, shaft fails the JFS will rate to 100% and stay there. start capability for that engine en lost.

problem with this failure is ou will not know what has ned. What you will see is that r engine is coming up to JFS ing speed, no matter which lift you raise; and inflight it e almost impossible to tell that S is at 100%. The only way this one is to de-energize the ircuit without affecting fuel o a running or stagnated e.

p To YOU

l, now that you know why the m can exist, and how you can urself into it, let's see what : done to prevent it. If you ence a dual engine stagnation, pooldown (throttle to idle at airstart as you attempt to sh a 350 knot dive into the nvelope. If the spooldown ot is unsuccessful (for le, hot start) your best option is a JFS Assisted Restart. If you follow the book–

1. **Throttle (right engine)—OFF**
2. **Centerline stores and pylon—JETTISON**
3. **JFS switch—CHECK ON**
4. **JFS handle—PULL AND RELEASE**

the engine rpm should be at or near 30% before the JFS reaches the speed necessary to engage. Thus, the odds of damaging the CGB shaft are low.

The first step, throttle-off, is extremely important as it starts the rpm decreasing back below 30%, while the other steps set the JFS up to assist the restart attempt. If you can afford an additional few seconds, waiting until approximately 30% rpm before pulling the JFS handle will virtually eliminate the possibility of shearing the CGB shaft due to an inadvertent engagement during a JFS start.

If you are forced to start the JFS with engine rpm above 30% or if you shut down an engine between 30 and 50% with the JFS running, you could shear the CGB shaft and accelerate the JFS to 100%. This condition would be obvious on the ground but is extremely difficult to detect in flight. Therefore, if you attempt an inflight JFS engagement and do not get an rpm increase, quickly cycle both master switches and try again. If you still get no response, cycle the master switches again and try the opposite engine. NOTE: Rapid cycling of the engine master switch will de-energize the start circuit without affecting fuel flow to a running or stagnated engine.

An Ounce of Prevention

The best way to avoid the problem described above is to avoid activating the start circuit during engine shutdown. At the present time only your careful movement of the throttles into cutoff without hitting the start switches will prevent start circuit activation but we don't want to have to rely on "technique" in a dual engine out situation. MCAIR is investigating ways to eliminate the problem completely; but in the meantime your throttle technique remains very important. If you want a chance to test your skill (without damaging hardware), try this drill when you go out to fly. After starting the JFS, place both throttles at idle. When ready to start the right engine, place the throttle in cut-off using your normal technique and see if the JFS engages. Before the second engine start, lift the left fingerlift and release it as soon as you start to move the throttle aft. The odds are good that you will get an inadvertent engagement on the right engine but you will be successful in avoiding it on the left.

Editor's Note: An Interim Operational Supplement has been issued against the F-15 "Dash One" to add the following statement in Section III under Starting, Abnormal Engine Start, Engine Fails To Accelerate Normally, after Step 2; and under Inflight, JFS Assisted Restart, after Step 7:

CAUTION

"Exercise caution when shutting down an engine with the JFS running. Release the fingerlifts prior to reaching the cutoff position to prevent immediate JFS re-engagement above 30% rpm."

TO IF-15A-1S-73 applies to A and B models, while 1F-15C-1S-10 pertains to C and D models.

Incidentally, MCAIR test pilots Pat Henry and Glen Larson recently had the opportunity to experiment with the F-15 simulator at Luke AFB, which has been modified to include Air Operable JFS. They report that with this added capability, the simulator is also a good place to practice your shutdown technique as well as Dual Stagnation and JFS-Assisted Restart procedures. Sounds like a good idea to us.—Courtesy Vol. 27 No. 2, 1980, *Product Support Digest,* McDonnell Aircraft Company. ■

MAJOR

Harry L. Brodock

CAPTAIN

Thomas C. Blow, II

CAPTAIN

Clarence J. Fennell

AIRMAN FIRST CL

Walter D. Pit

42d Bombardment Wing (H)
Loring Air Force Base, Maine

■ Major Brodock and crew, temporarily assigned to the 306th Strategic Wing, were flying a night refueling mission in a KC-135 with 10 passengers aboard when Major Brodock learned through a Guard transmission that an F-111F, Trest 56, had experienced an explosion during a touch and go landing at neighboring RAF Lakenheath and that damage was unknown. Arrangements were made for the tanker to stand by for emergency refueling. Captain Blow took over the required radio communications and arranged refueling headings, altitudes and turn ranges. Honington Approach Control coordinated a rendezvous at 4,000 feet Mean Sea Level. During join up, the F-111F lost all utility hydraulic pressure and the left generator. Using Honington Radar vectors and air to air tacan for separation, the two aircraft established themselves within two miles of each other. The F-111F initiated refueling operations with only 15 minutes of fuel remaining. Airman Pitts' first expedient contact saved the F-111F crew from a flameout and ejection. Moderate turbulence seriously hampered refueling operations and, combined with reduced maneuverability of the receiver aircraft in the landing configuration caused several disconnects during the half hour ordeal. At the slow air speed, the boom was very sluggish and required considerable lead time in its operation. Airman Pitts skillfully maintained contact despite reaching full boom limits. Towards the end of refueling operations, he was forced to pressure refuel and maintained boom contact by touch only. A total of 11,000 pounds of fuel was transferred to the F-111F prior to the KC-135 experiencing a refueling boom malfunction. A visual inspection of the damaged aircraft revealed the left main wheel was missing. Major Brodock described the damage to the RAF Lakenheath maintenance personnel and crash network. The tanker's refueling boom malfunction was continuously pumping fuel overboard at a moderate rate. Due to the aft fuel system, the tanker developed an adverse center of gravity which became more pronounced and aggravated the longer the KC-135 remained airborne. Landing weather was 300 feet overcast, direct crosswind at 20 knots, and a wet runway. A perfect approach was flown in spite of the crosswind and aft center of gravity. The professional competence, aerial skill and superior crew coordination displayed by Major Brodock, Captain Fennell, Captain Blow and Airman Pitts directly contributed to the successful recovery of both aircraft. WELL DONE. ■

☆U.S. Government Printing Office: 1980-683-214/11

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and professional

erformance during

hazardous situation

and for a

nificant contribution

to the

ited States Air Force

Accident Prevention

Program.

CAPTAIN

Patrick W. Chandonnet

CAPTAIN

John G. Sletten

430th Tactical Fighter Squadron
Nellis Air Force Base, Nevada

■ On 1 February 1980 Captains Chandonnet and Sletten launched from Nellis AFB, NV as an airborne spare for an F-4D deployment. Following A/B termination, the crew felt a vibration coming from the left side and suspected a loose panel or problem with their travel pod. Upon slowing to 250KTS, their Right Generator Out light came on, and the generator would not reset. The crew declared an emergency with approach control. As they prepared to return to Nellis, the left utility hydraulic system failed, followed by multiple caution and warning lights. The crew suspected a bleed air duct failure, and as Captain Chandonnet maneuvered to avoid populated areas, Captain Sletten reviewed the multiple checklist items. Eight miles from the field, the Right Engine Fire light began flashing and Captain Chandonnet retarded the right throttle to idle. Being so close to the field, and because neither smoke nor other instruments confirmed a fire, the crew elected to leave the right engine in idle rather than risk landing single engine with total utility failure. The crew jettisoned the centerline and outboard tanks and turned toward Nellis. While setting up for final approach, their right utility system failed, followed rapidly by a steady Fire light on the right engine. They blew down the landing gear and flew a no-flap approach, using the left engine for power, with the right engine in idle. After engaging the approach end cable, their right engine auto accelerated and Nellis tower reported smoke coming from the engine. The crew shut down and ground egressed. Postflight maintenance inspection revealed severe damage to the hydraulic system and high potential for an in-flight fire had the mission lasted any longer. The aircraft system knowledge and crew coordination demonstrated by Captain Chandonnet and Captain Sletten resulted in the recovery of a seriously disabled aircraft. WELL DONE! ■

The first year of F-16 operations has been highlighted by flight deployments and evaluations and by aircraft deliveries to six air forces around the world. The F-16 has proven its capability during the first year of operation in three countries. Currently, over 100 F-16s are in service in the six air forces, with more than ten aircraft being produced each month.

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

OCTOBER 1980

REQUIEM FOR A HEAVYWEIGHT

THERE I WAS

■ *This is the first response to this feature and it is a classic. It's an example of what can happen when seemingly unimportant things are omitted from our flight preparations. This one we'll title* GET-HOME-ITIS. *An old term we've all heard, many of us have had it, some of us survived, others did not. Read and heed. Thanks.*

We had an RON at an en route base and I, as an FNG, had swapped aircraft with Lead because his bird had intermittent radios. We were anxious to get to our destination and turn the aircraft into the MOD program as we were scheduled to deploy in the immediate future and were in a hurry to catch the transport that would get us back to the squadron.

I preflighted both aircraft while he went to Ops to file our IFR flight plan. Unknown to me, he changed the route of flight to avoid a line of TSTM that lay along our planned route of flight. He got the clearance over the radio using ground power (only one ground unit was available) because we had a final leg that stretched our fuel and we didn't want to start and use up extra fuel.

After takeoff I was having trouble with my comm and nav radios, so the strange headings we were using just added to my confusion. We were skirting the tops of the TSTM's in the milky stuff at 42M' when my engine unwound to idle, I lost pressurization, and the inside of the canopy iced over. I couldn't maintain position, obviously, so Lead dropped back into a wing position, and we started a glide into the top of the TSTM's. He transmitted "You're in a turn." My gyros looked okay but in the face of the previous electrical problems I lost the faith. "Which way?" and "Roll right!" "You rolled too much—roll left!" With that, the airplane departed controlled flight.

I recovered in the TSTM using needle, ball, altimeter, and airspeed. My radio calls on the last known frequency got no response. My engine was running okay at 21M', but I was lost, in the middle of a TSTM, with (I thought) bad gyros, bad radios, and an unreliable engine. Guard channel got me a GCI to a GCA in ⅛ mile, obscured, 30 kts gusting to 50 with 4 inches of water on the runway and heavy turbulence. That was 27 years ago. My leader dug a hole 42' deep with him still in the cockpit.

I never launched again without everyone in the flight having a *complete* IFR briefing, good radios, good nav gear, and the answer to the question "Does this flight smell of get-home-itis?"

This new USAF program is s and there are very few rules t member. Basically, we want a mous accounts of personal erro mistakes that we can publici warn others not to make the mistakes. The end hoped-for r of course, is a reduction of our ator factor losses. The form t out is the ultimate in simplic nearly blank page on which we begun the first sentence with " I was"–the rest is up to the w The reverse side of that page i addressed to the Director of space Safety so after the story is just fold, staple, and mail. sign or identify yourself or we want total anonymity. I wil sonally read each account. If sidered appropriate, the l learned from the account and ventive measures, if any, will be licized. In effect, save an air save a life, tell your war story Air Force through the "There I program.

Sample forms were sent to offices in the August issue o USAF Safety Journal *for r duction and dissemination locall*

Brig Gen Leland K. Lukens
Director of Aerospace Safety

TED STATES AIR FORCE

AEROSPACE

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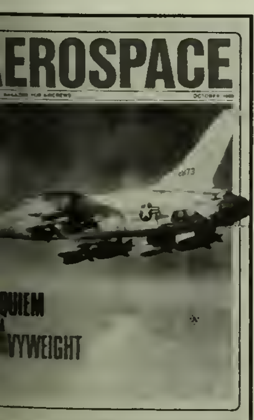

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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THEY WALKED AWAY
F-4 Emergency Evacuation Procedures

By CAPTAIN SKIP BREMER
27TASS
Davis-Monthan AFB, AZ

■ In this article written for the McDonnell Douglas *Product Support Digest,* Captain Bremer discusses "BOLD FACE" procedures for emergency ground egress from the F-4. Air Force experience during the past couple of years underlines the importance of all aircrews having these procedures down letter perfect.

All of us who fly the F-4 know that it has an impressive ejection record; and because of this we probably do not concern ourselves with the particulars of that system as much as the crews of "Brand X" aircraft. Our faith in the reliability of the fine product of Messers. Martin and Baker gives us much comfort, but can we say the same for the "other" egress system in the Phantom— the one that gets us out when we don't want to use the super rocket assist?

Recently there has been an increasing number of emergency ground egress experiences that have not gone as smoothly as one would have liked. We have been hearing such after-the-fact comments as . . . "I forgot about the sticker clips." "I got stuck in the %$#&*#%$ restraint lines!"

I personally would not want to find myself in one of the above situations if I were trying to "get out of Dodge." I'm sure that you all know the BOLDFACE procedures by heart, but do you also know what each step really accomplishes as your heart is pounding and you're fighting off that panicky feeling? Let's examine the emergency egress procedures, one-by-one, to see what's behind the required actions.

1. LOWER GUARD—UP
2. SHOULDER HARNESS—RELEASE
3. INSIDE HANDLE—ROTATE AFT
4. OUTSIDE HANDLE—LOCK UP
5. Canopy—OPEN

Even though the wording has changed over the years, the intent has remained the same— five quick steps and you're out. I won't spend any time on the fifth step here only because there have been few problems with the canopy itself. Of course you all realize that it is a rather important step in evacuating the aircraft. These first four steps give you a shortcut in exiting your Phantom, since by my count, the normal method requires at least eight to ten different movements.

1. LOWER GUARD—UP

This is the guard for the lower ejection handle, located on the forward edge of the seat bucket, which prevents inadvertent operation of the handle. You may have thought that this was accomplished by "hiding" the handle opening from your fingers, but actually it has an internal mechanical lock that prevents the handle from becoming unseated. This is a pretty good first step because if you accidentally pulled the handle, or kicked it up, or got it tangled in the leg restraint lines, you could find yourselves leaving the aircraft much faster than anticipated. If you decide to get out of the airplane prior to takeoff, there is a good chance that this guard will already be up.

2. SHOULDER HARNESS —RELEASE

There is no mystery to this maneuver— you can't very wel the Phantom if your parachute attached, unless you take the e seat with you. And remember are two of these releases, so m one of them is like forgetting b them. Here's a technique you want to use: Lean forward slig put pressure on the straps (it h have your reel locked), then ta each hand and point it at its respective release (left hand fo release, right for right) with th fingers together. Starting with forefinger, raise the hands in a sweeping motion up under the outer latch piece. The forefing should catch the latch (if it do the middle finger will) and pus latch up. Now bring the finger and your middle finger should bottom latch. It takes only a li movement of the bottom latch release the shoulder straps, esp if you've kept the pressure on by leaning forward. Now you just two quick moves to go.

3. INSIDE HANDLE —ROTATE AFT

This is the survival kit relea handle, the yellow one closest your right knee. Simply grab i your right hand, pull it up and until it separates from the seat, toss it. When you do this, you release the survival kit restrain straps on either side of you, al the kit to remain in the seat wl you stand up. Before you stan there is one more essential ste

. OUTSIDE HANDLE -LOCK UP

This is the emergency harness elease handle located just to the ght of the survival kit release andle. To actuate the handle, just queeze the trigger and pull the andle aft until it locks in the up osition. This action releases the apbelt and leg restraint locks, llowing the garter retraction lines to e spring-ejected from their locking eceptacles. (When used in-flight for nanual seat separation following jection, this handle triggers other ctions, one of which you will robably notice now.) The parachute estraint lines are released, allowing ne parachute pack to drop slightly nd push against your upper back. Vhile this may distract you, it hould not hinder you in your scape.

JP and OUT

After opening the canopy (Step 5), tand up briskly so that the sticker lips will release easily. A properly ttached and tightened kit aids in a lirect, low-force separation of the sticker clips. Now before you arbitrarily decide to launch out of the cockpit, take the time to raise first one foot and then the other onto the survival kit to check that the leg restraint lines have not become entangled.

If you are in the back seat, finding the safest wing to exit over is probably your best bet, but take your time to be safe rather than sorry.

From the front seat, sliding over the front glass and off the left side of the radome should be as safe as any maneuver, as long as you keep in mind just how far off the ground you are. Remember that the AOA probe and the pitot tube are just waiting to catch you, as is the ladder in the fighter models.

The best way to make this ground egress procedure work is with practice; and you are fortunate to have several avenues of practice available to you. The next time your friendly Life Support Officer says your time has come, take advantage of it— practice the egress procedures. You also have an opportunity to practice every time you visit the beloved simulator; after all, you don't want to stay in there forever.

In case you haven't already guessed why the ground egress system isn't as reliable as the ejection system, it is because of the built-in human factor associated with ground egress. It's hard to really practice the ejection procedure, but when working correctly, it's all automatic anyway. But Steps 1 - 5 on the ground require human thought and action, and thinking can get us "humans" in trouble every time.

So do yourself a favor by becoming "letter perfect" on emergency evacuation procedures— as the good book says, aircrew members should be able to accomplish BOLDFACE procedures without reference to the checklist. Who wants to read a book while Rome is burning? Having a fire on start means three things to me— Call the crash crew if possible, cut the throttles and masters, and get out NOW! I'm prepared to do these things quickly and smoothly. Are You? ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

FACT VERSUS PERCEPTION – the "Fightergator" enters the 80s

By CAPTAIN JOSEPH H. WEHRLE, JR.

■ Let's see if I can put it all together. You work for an employer who's searching for an automated system to make your job obsolete. He traditionally combines this with somewhat less than optimum career progression, low promotion rates and an overseas assignment outlook that lets you claim dual citizenship. Sound familiar?

If you're a WSO (Weapon System Officer) in today's fighter force, it should! It's the popular version of a WSO's career and resulting life style – you and I have heard it, described it, and lived it. How much is truth, how much is perception? Is anyone working the problem, or should we all give up and either quit or accept "the obvious?" Since coming to MPC and taking on "the obvious" face-to-face, I've learned that while some of the WSO's woes have been based on fact, many haven't – and there are some good things happening.

The WSO Career Outlook

Despite what you guys at Nellis or Kadena see happening on the flight line, the WSO career field is far from becoming obsolete. Even with the advent of the single seat fighter, the known dual cockpit inventory decreases by less than ⅓ between 1982 and 1989.[1] Though the specific numbers are classified, a large WSO requirement both in and out of the cockpit will exist through this decade and well into the next.

As an offset to this requirement reduction, low UNT rates will keep the WSO inventory in a shortfall situation through 1983, so any WSO who remains on or returns to active duty can be assured of gainful employment. Additionally, future candidates for the two-seat fighter inventory are also being evaluated, but it's far too early to make any guess on exactly what types will be designed, programmed, budgeted, or bought.

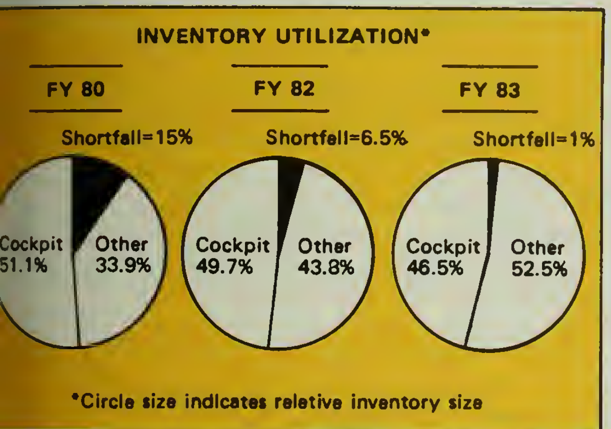
Assuming you'll buy my premise that we'll have more jobs than WSOs for some time to come, let's look at what kinds of opportunities we're talking about. Two major trends become apparent as we attempt to analyze a downstream career outlook in terms of what's happening today and what's programmed to happen tomorrow.

[1]FY 82-89 USAF OBJECTIVE FORCE, AF/XOXFI, 15 December 1979, p. 283.

First, operational supervisory positions for WS[...] really beginning to open up. Before you start to lau[...] turn the page, let's look at the facts. As recently a[...] years ago the idea of WSO "operational" progressio[...] absurd. To get promoted, you had to move toward[...] or supplement duties – the cockpit was a relative [...] "graveyard." Fly, get your gates, and depart for th[...] of the flying desk, MPC told me and others. Rai[...] that environment, it's not surprising that today's [...] grade WSOs returning to cockpit duties due to inve[...] shortages see the move as an abrupt reversal in [...] progression. They're finding, however, that the sit[...] has changed somewhat for the mid-career WSOs th[...] greeting them at the squadron door. Title 10 and [...] very high level emphasis are providing expanded [...] opportunities, as evidenced by nearly 85 of ou[...] WSOs who are currently flight commanders. On [...] that there are currently nine ops officers and seven s[...] ron commanders. Not much when you compare it [...] pilot numbers, you say? Give those flight comman[...] few years – remember, it was only in 1975-76 time [...] that we began to see WSOs in these jobs at all, a[...] fective operational supervisors grow into the jobs[...] phasis for these shifting career patterns comes right[...] the top – the Chief of Staff has personally pushed i[...] real question to be answered is, do we care? Change[...] these take time and only our dedicated efforts, con[...] career oriented attitude and proven performanc[...] accelerate the process or even make it work at all.

The second trend one sees in the WSO career ou[...] stems from improvements in the ratio of cockpit to [...] supplement jobs available. As nearly any field grade [...] can tell you, a few years ago it seemed to take f[...] before a WSO could break out of squadron-level d[...] This was due to the simple fact that most WSO jobs [...] in the cockpit. As single seat fighters replace a p[...] that cockpit requirement, however, the overall re[...] ment structure for WSOs is beginning to take on [...] better balance. Mid-level (senior captain/junior m[...] WSOs will find themselves made increasingly ava[...] for duties in the staff, supplement, AFIT, ATC, [...] and other areas. The figures below can perhaps best [...] trate the trends that will really change our oppor[...] to career broaden. The "shortfall" shown repre[...]

e difference between total WSO requirements and inntory — a shortage that is decreasing as UNT rates begin increase and the cockpit requirement decreases.[2]



Now that we've discussed both cockpit and staff/supment career opportunities, let's put the package tother and develop possible career patterns. The Aviation reer Incentive Act provides minimum guidelines for e frequency and amount of cockpit duty (in terms of iation gate months) needed for continuous pay. The in variables in the equation, therefore, are the freency and amount of time spent in other duties. The timum job mix is one that provides the best progression portunity in the sense of career broadening without triment to viability as a rated officer. This latter measе can be generally defined in terms of flying time and rrency, and is vital to an officer's competitiveness for omotion and the better rated jobs at every level, parularly in the fighter arena. Balancing all these variables tails cockpit duty through at least the first aviation gate 2 months) followed by other tours of duty interwoven th at least enough cockpit time to reach the third gate 32 months).

ta prepared by AFMPC/MPCROR 5, 3 June 1980.

Again, the ability for you to plan and realize your desired career pattern depends in large measure on *your* performance — don't expect a high-powered staff job if your cockpit skills are limited or outdated! I know that you've heard it before but I've learned it's true — "your best career development job is the one you have right now." As it is in most instances, the proven performer will continue to be rewarded at the expense of others.

The WSO Promotion Outlook

Promotion opportunity and selection rates are on everyone's mind — primarily due to the '79 and '80 Major's board results. The navigator (especially the WSO) was hit hard — hard enough to send our attrition rates through the mach. Trying to pinpoint the exact reason for the problem is difficult at best, but I've just finished giving it my best shot.

Jumping in the middle of all the published statistics about pilot vs navigator, crew vs staff, OER ratings, PME, advanced education, job title, etc., one point rings clear — the basic decision on whether to promote or not is primarily subjective. "Does this officer have the potential to assume the added responsibility associated with the next grade?" Contrary to what I know many WSOs feel, my homework strongly indicates that the promotion boards have been fair and square, with no discernible bias as to aeronautical rating. Overwhelmingly, the primary indicator of any officer's potential as measured by the board has proven to be the quality and consistency of performance as reflected in the OER.

Digging into the statistics even further shows that with all factors being equal (OERs, PME, etc.), all officers, regardless of wings, get promoted at approximately the same rate. For example, the average pilot and navigator entered the board with about the same level of PME and advanced education. Also, pilots and navigators with the same OER profile got promoted at essentially the same rate. Again, my impression is that the statistics simply don't support any claims about promotion board prejudice.

So why the discrepancy? It's what we suspected all along — the *average* navigator did not enter the board with the same OER profile as the average pilot. For example, on the CY 80 temporary major's board just looking at the ☞

final OER written under the controlled cycle for those that were considered for the first time.[3]

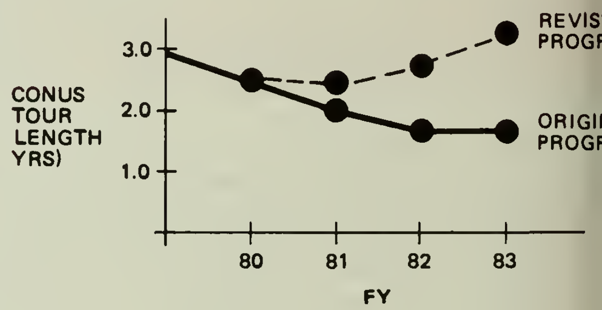
OER Rating	Pilot	Nav
1	33.6%	23.8%
2	37.6%	36.2%
3	28.8%	40.0%

More specifically, under the controlled system, the WSO was in direct OER competition with the *fighter* pilot. On this most recent board, the fighter pilot was promoted at a 5 percentage point higher rate than the non fighter pilot (90.3% vs 85.3%) – nor surprisingly, therefore, the WSO promotion rate was nearly 3 percentage points less than the nonfighter navigator (69.4% vs 72.3%). What's the outlook? Obviously, the navigator (and especially the WSO) must recover from the controlled OER era. Along that line, I've noticed that the further we get into the uncontrolled OER program, more of that recovery is being seen – most probably due to the career development trends that we talked about earlier in the article. How much of a recovery? For new eligibles on the 1979 temporary major board, the selection rate difference between navigators and pilots was 17.2% – on the more recent board, 13.0%, an improvement of 4.2%. It's definitely a start in the right direction toward giving us more than hope that as the ops and staff opportunity increases, the true performer, whether pilot or WSO, will rise to the top.

The WSO Overseas Assignment Outlook

In the mid and late 70's, as the initial F-4 squadrons began to convert, a dramatic and somewhat unexpected change in WSO overseas requirements began to take place. Aircraft and crews from overseas converting squadrons, instead of returning to the CONUS as planned, sometimes remained in theater to supplement or "flesh out" existing forces. CONUS squadrons, however, continued to convert as programmed, reducing WSO stre stateside. Combining this growing overseas imbal with reduced UNT production rapidly shortened the length of the CONUS-based WSO. In fact, as earl 1978, the WSO shop at MPC projected that program force beddown plans, coupled with the low proposed output would mean an average WSO CONUS tour le of less than two years by 1981/82.

With the strong support of the TAC commander, a ordinated plan was recently approved by the Air Sta alleviate the overseas imbalance through increased production and changes in the force conversion sched More UNT production was approved, but due to bu constraints immediate increases were impossible. help us through the 1980-83 crunch period, an incre distribution of the available UNTs was provided to fighter world at the expense of other MAJCOMs. W out these initiatives, a CONUS tour length of less two years would be with us today. Moreover, the f conversion plan was significantly changed, reducing WSO overseas requirement in the 1981-82 time fra The effect on projected WSO CONUS tour lengths be dramatic:



Notice that under the new plan, three year state tours should be a reality by the fall of '81 or earl '82. Barring adverse changes, stability for '82 and yond should allow more WSOs to move CONUS CONUS when career development or volunteer st call for it.

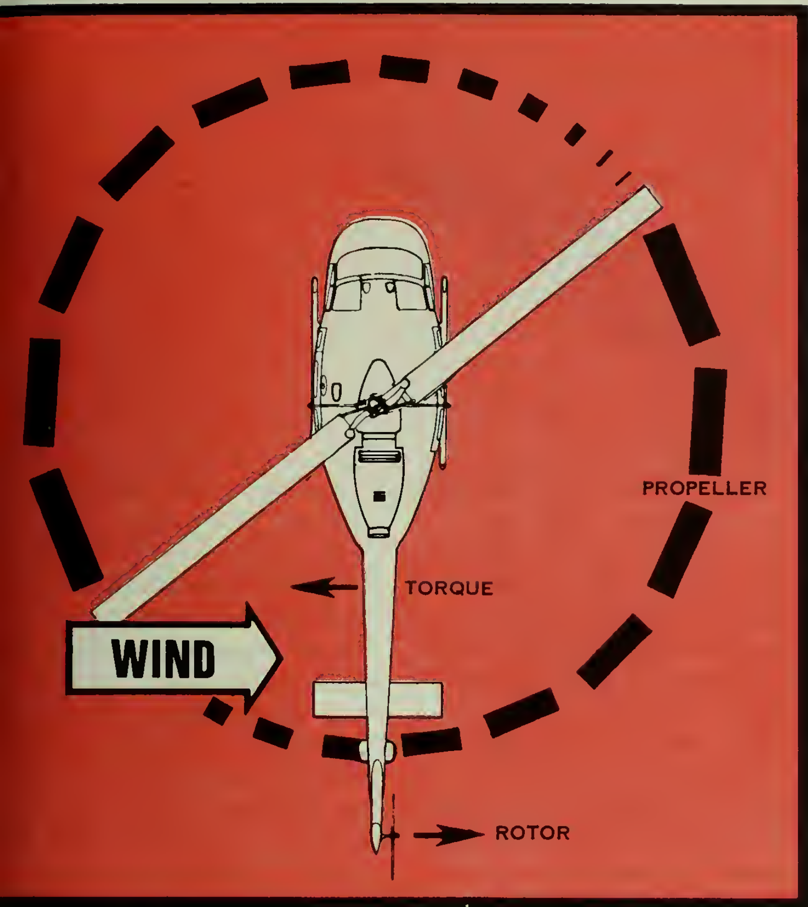
That's my perspective on the three major prob areas facing the WSO – career outlook, promotion portunity and the overseas imbalance. By looking at facts, I hope you'll conclude – as I have – that the r problems have been identified; solutions are being work and what seemed so "obvious" in the way of real or p ceived roadblocks yesterday, is not so "obvious" tod

About the Author

Captain Wehrle is a 1970 graduate of the United States Mili Academy. He's a career WSO with tours of duty in Thailand, Ph pines, Korea, and the CONUS. He has over 1,100 hours in the and since 1978 has been assigned to the AFMPC Fighter Shop.

[3]Data furnished by AFMPC/MPCY, 1 June 1980.

NOTE: Due to abbreviated and training reports, an individual's last controlled OER may have been rendered in 1976, 1977, or 1978



ail Rotor Breakaway

By CAPTAIN M. J. T. HEWETSON
Army Air Corps Center
Middle Wallop
Stockbridge, Hampshire
England

"Any helicopter with an anti-
que tail rotor is subject to the
sibility of losing total tail rotor
ist for no apparent reason."
Vhen a statement like that is
de, hands are thrown up in horror
cries of "nonsense!!" ". . .
rofessional!" and similar
hemisms are heard echoing
ugh the corridors of aviation
ver. The reason is obvious; poor
nanship and overcontrolling by
aviator can result in running out
eft antitorque pedal. This is the
mal perception of the intent of the
ement. However, we are not
sidering the problem of not having enough tail rotor thrust. What is being addressed is the sudden and abnormal reduction in thrust produced by the tail rotor accompanied by a rapid and large torque increase, caused by some aerodynamic disturbance. It may occur at "mid-pedal setting"; it is the loss of thrust. For want of a better expression, it can be described as "tail rotor breakaway" or "tail rotor stall."

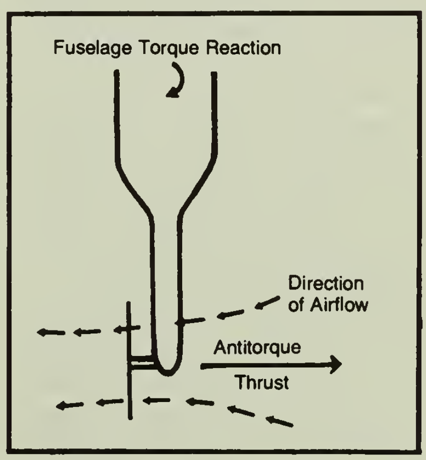
Before studying the conditions required for such an aerodynamic phenomenon, it is worth returning to basics and considering what the tail rotor actually does and how it does it. Let us consider those tail rotors which are mounted on the left, or port side, of the tail boom. From Figure 1 it can be seen that to provide antitorque thrust the tail rotor is a "pusher"; its thrust is against the tail boom and fin. This thrust can be considered in the same way as "lift" is explained for the main rotor, so, as we all know:

Lift = $CL\frac{1}{2}pV^2S$

Where "CL" is the coefficient of lift, a function of blade design and angle of attack, "p" is air density, "V" is the relative rotational velocity of the blades, and "S" is the surface area of the blades. Any change in any or all of these factors will result in a change in lift, or in this case tail rotor thrust. This basic formula should be borne in mind throughout this study.

The Empire Test Pilot School at Boscombe Down in England made a study of tail rotor breakaway and produced theories for the required conditions; but, as far as prevention of and correction for the

Figure 1



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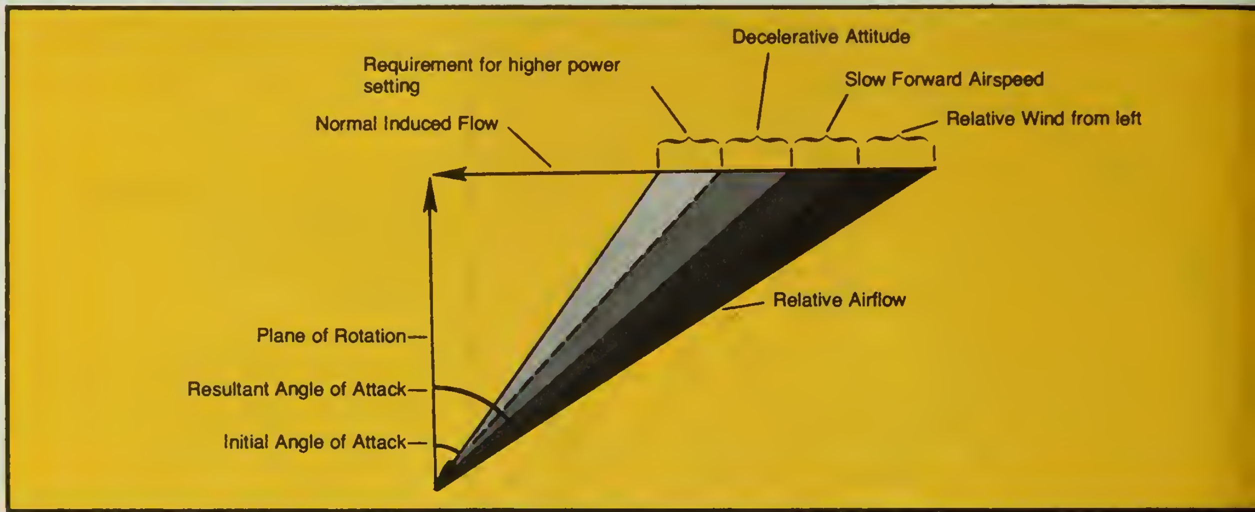


Figure 2

phenomenon, their paper was, at best, scant. It is the purpose of this discussion to recount their theories and, without being too presumptive, to suggest some remedies.

In general there are four conditions associated with tail rotor breakaway. The first condition is that of a requirement for high power. The second is a decelerative attitude, hence slight tail-low attitude. Third, this attitude must be held at a low airspeed. Last, and most controversial, a relative wind from the left of 5 to 12 knots is required.

When considering *high power*, the maneuvers to be considered may be any which require a high power setting resulting in a large tail rotor thrust, therefore a high angle of attack. Such maneuvers could be an approach to a hover, or confined area operations at high gross weight (GWT) or high density altitude (DA), or even nap-of-the-earth (NOE) operations.

A *decelerative attitude* will result in the combination of the downwash from the main rotors being reflected from the synchronized elevator, and a certain amount of turbulence generated by the airflow passing upwards over the elevator. The result is an opposition to, or a disturbance of, the airflow through the tail rotor. Back to basics again, if the airflow is disturbed over an aerofoil, then lift is reduced. Hence, more pitch to the tail rotor blades is required to produce the same antitorque effect. Therefore, a large angle of attack is needed.

At *slow airspeeds* a high power setting is required unless a rate of descent is accepted. The downwash angle of the main rotor is therefore increased. Once again, the airflow through the tail rotor is disturbed further, resulting in the need for a still larger angle of attack.

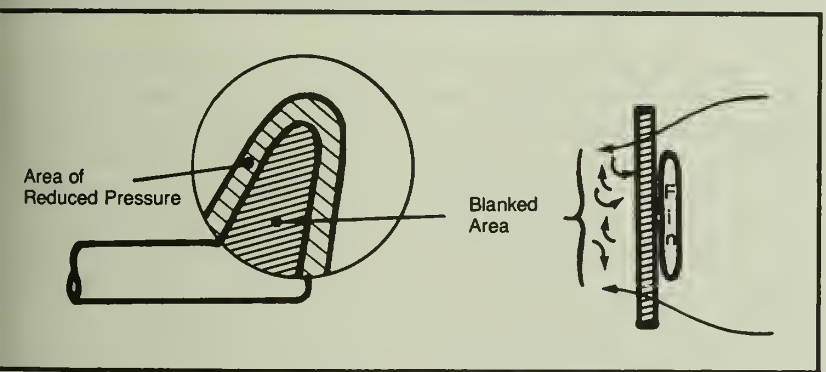
The last condition was a *relative wind from the left*. Most aviators would state that wind from the left is an aid rather than a limitation to antitorque control. However, in so stating, they are considering the effect of that wind on the tail boom rather than on the efficiency of the tail rotor. If the effect on the tail rotor is examined, it can be seen that such a wind would be in direct opposition to the airflow through the tail rotor. The result is a momentary deterioration of the efficiency of the tail rotor. The combined effect of these conditions can cause the tail rotor to stall, hence the resultant uncontrollable yaw to the right; uncontrollable since if antitorque pedal is applied, then the stall deepens. The tail rotor can be said to "break away" aerodynamically. For those who have a mania for vector diagrams, the combined effects of these conditions are simplified at Figure 2.

In the September 1977 issue o the *U.S. Army Aviation Digest*, there was an article called "Hov Crash – By the Book." It depict an OH-58 Kiowa pilot who was flying NOE in a racetrack patter downwind, then turning right int the wind, using too much right antitorque pedal. The pilot admi to a very low airspeed. He experienced a total loss of tail ro control in the turn. By turning ri with too much right pedal, he w effect forcing the tail to the left, inducing a relative wind from th left. His predicament was never explained. Perhaps if one review the conditions described above, of which were present in this incident, it could be said that thi aviator experienced tail rotor breakaway.

It is worth considering anothe allied explanation for tail rotor breakaway. When the phenomen of settling with power is studied with reference to the main rotor system, the conditions required, basically, are a high rate of desc at low airspeed, and power appli Now make a comparison with th tail rotor in the described situati A high power setting is present; wind of 5 to 12 knots is equival to 510 to 1,220 feet per minute,

wind from the left on the tail rotor surely the same as a rate of scent; the slight tail-low attitude is ained by the low airspeed. sentially the conditions for settling th power are the same as those for l rotor breakaway. Hence, the enomenon also could be described settling with power on the tail tor.

This latter explanation is useful ien corrective actions and eventive measures toward the enomenon are studied. If any one the required conditions is minated, then the aviator has rrected for settling with power or l rotor breakaway. The corrective tions for settling with power of main rotor system are to reduce wer, or gain airspeed, or both. e same actions correct for tail or breakaway. The gaining of speed eliminates the tail-low itude and slow airspeed and thus luces the requirement for a high gle of attack. This action



jure 3

viously may not be possible in nfined area operations or NOE erations. The other recovery ion is just as difficult to perform. lower the power, or angle of ack, right antitorque pedal must applied. Since the aircraft is eady turning rapidly to the right, ch an action is unnatural. wever, the result of either action ll reduce the yaw. Tail rotor eakaway is then obviously not a uation that any aviator, in an operational setting, would wish to encounter.

Before concluding with preventive measures, there are two other areas of concern, both of them design features, which can aggravate the possibility of tail rotor breakaway—exhaust gases and the tail fin. At the slow airspeed, tail-low attitude that has been considered, the exhaust gases produce local heating of the air around the tail rotor. The density of this air is therefore reduced. Thinking back to our basic formula, the only way for which this drop of air density can be compensated by the aviator is by an increase of angle of attack of the tail rotor. The tail fin effectively "blanks off" a portion of the tail rotor disc area. By studying Figure 3 it can be seen that not only is little thrust produced in this area, but also there is an area around the fin that is nonproductive. In the case of the UH-IH Huey, this total nonproductive area is about one-third of the total tail rotor disc area. If the same area is examined on an OH-58 with its relatively large tail fin, then an even greater portion of the disc area is affected. Due to the design of the tail rotor, the surface area of the blades, and the size of the tail fin, it is suggested here that the Kiowa aircraft is prone to tail rotor breakaway. Conversely, due to the size of the tail rotor blades and the relatively smaller tail fin on the Huey, the phenomenon is less likely to occur.

Therefore, design features may prevent or produce the chances of tail rotor breakaway occurring. Apart from the design features of the tail rotor and the fin there is another feature which would assist in alleviating this problem; mount the tail rotor on the right, or starboard side, of the tail boom, as in the AH-1 Cobra, to yield a more efficient tail rotor.

Having mentioned how design features may alleviate the onset of tail rotor breakaway, it would be highly amiss not to study the preventive actions that an aviator may take. As mentioned above, if any one of the required conditions for tail rotor breakaway can be eliminated, then, it can be proved, prevention is accomplished. The two factors over which the aviator has control, and which should be considered when operating into confined areas at high GWT or high DA, or when operating at NOE, are a relative wind from the left, and the requirement for high power. Power must be monitored closely and demanded with care; the aircraft must always be in trim unless there is a possibility of a tail strike. In that case the tail should be moved judiciously. The possibility of having a relative wind from the left, whether naturally or artificially produced, must be borne in mind and avoided if at all possible.

Without wishing to see any further limitation imposed when operating at NOE or when conducting other maneuvers near the borderline of the aircraft's limitation, this phenomenon must be considered by discerning aviators at all times so that they may carry out their mission successfully. It is hoped that this short discussion of an aerodynamic short fall in helicopter design will help aviators to understand their machines better, and to enable them to prevent a failure of mission due to the environment in which they work. ■

Courtesy *U.S. Army Aviation Digest*, June 1980.

SEASONAL HAZARD

By MAJOR JAMES L. GILLESPIE, CF
Directorate of Aerospace Safety

■ A soaring bird is a beautiful sight to some people. To the pilot of a high-speed jet aircraft however, it represents a hazard which could spell disaster. Each year the USAF experiences hundreds of aircraft collisions with birds which result in millions of dollars in damage. Over a 2-year reporting period, 1 Apr 78 to 31 Mar 80, there were 3,258 reports submitted of birdstrikes with USAF aircraft. Fortunately, no crashes or fatalities occurred; however 5.775 million dollars worth of damage resulted, and several close calls were experienced. We weren't always so lucky. Documented evidence indicates that during the past 12 years seven military pilots have been killed and 14 aircraft destroyed because of birdstrikes. Birds are suspected in several other aircraft crashes as well.

The problem is not unique to the military. Commercial aviation records show that within the past decade there have been 29 civil registered aircraft destroyed and 14 fatal accidents where birdstrikes were a factor. During the last seven years, birdstrikes have resulted in the destruction of jet transport and executive aircraft at the rate of one and one-half per year. During 1978, there were 36 reports submitted to the FAA detailing birdstrike damage to aircraft ranging from windshield penetration to the fatal crash of a Convair 580. These aircraft had passenger loads ranging from 2 to 265 people.

The bird-aircraft-collision problem is with us every day of the year. Statistics indicate that most strikes occur at or near airports, either on takeoff or landing and below 3,000 feet AGL. A graphic display clearly indicates that the months of April/May have a higher incidence of birdstrikes than the norm. The rate decreases slightly during the summer months, June through August, then rises dramatically in September, Octob and November, with October bei the peak month with over twice a many reported birdstrikes as any other month of the year. October also produces more damage per strike, which is understandable si this time of year represents the pe of the migration season. The potential for birdstrike disaster reaches its peak as waterfowl, weighing as much as 15 pounds each, move South into their winte habitat.

The greatest movement of waterfowl is along four primary routes: the Atlantic, Mississippi, Central, and Pacific flyways. Because of their size and large numbers, ducks, geese, and crane present the greatest hazard. These hazardous species of birds are preceded by migratory song birds The smaller birds have been involved in serious mishaps, but generally they cause minimal damage.

These photos show damage inflicted by bird of unknown species on a T-38. Front windshield was cracked and the front canopy shattered. Closeup shows extensive damage to area directly behind the front headrest and drogue chute. IP was unhurt and student in front seat received only minor bruises. Left engine damage resulted from ingestion of pieces of canopy plexiglas.

your flying unit suddenly unters numerous flocks of small s in their flying area during ation season, it is probable that les of much larger waterfowl soon arrive. An increase in l bird impacts found on light inspections will aid in tifying those operations which l the greater risk from birds. If base of operations is on or near of the four main migratory ays, or if you are required to rm flight into these areas, there ositive steps which can be n to lessen the hazard.

Limit night flights as much as ible during October and ember; these are the peak ation months.

If numerous small bird impacts xperienced, curtail night flying pproximately one week to allow small bird flocks to exit the area. They transit an area kly and quite often at night.

Flights below 10,000 feet AGL should be kept to a minimum because most migratory activity occurs between 1,500 feet and 5,000 feet AGL.

▪ Airspeed below 10,000 feet AGL should be kept as low as practical. Each time the airspeed doubles, bird impact forces quadruple, and it is not uncommon for a mallard duck to create an impact force of 200,000 pounds.

▪ If at all possible, landing lights should be displayed below 10,000 feet AGL to assist in bird avoidance. If birds are encountered, the aircraft should climb since bird distribution diminishes with altitude; also, it has been determined that birds in flight that are startled or feel threatened, instinctively dive.

▪ Use of low-level routes should be scheduled between 0900 and 1500 daily because waterfowl activity is at a minimum during this time. Preference should also be given to routes with an East-West orientation to further reduce exposure, and route segments that fly over bodies of water should be avoided.

▪ Visors should be worn by the pilots at all times during flight below 10,000 feet AGL, and the windshield should be heated to improve bird resistance.

▪ Low-level mission briefings during September, October, and November should include bird encounters and actions to be taken in the event of a birdstrike which may result in serious injury to the pilot or loss of cockpit communications.

▪ Local state and federal wildlife officials are the best source of information on local bird movements. Flyway data have been published in various documents, and this information can be procured from your region offices of the US Fish and Wildlife Service at the US Department of the Interior.

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SEASONAL HAZARD

continued

Although the spring and fall migration seasons present the greatest hazard, bird avoidance is a year around requirement. A great deal of activity is devoted to the bird/aircraft problem, and an important part of it is the reporting of bridstrikes. Without the statistical data to study, new and more effective control measures cannot be taken. Progress has been made in some areas — specifically, the bird populations in and around airfields. A study released in April 1976 indicates that 51 percent of the reported birdstrikes occurred within five miles of the airfield. More recent data show this figure to be 46.6 percent. This may indicate that airfield environment control programs are producing positive results. Improving drainage, proper ground cover management, the use of alarms, shell crackers, birds of prey and disturbing bird nesting habits all have had some effect.

Several countries recognize the hazard birds pose to aviation. Canada and several of the European countries have expended a good deal of effort toward the resolution of this problem. Research into the effects of ground and aircraft-mounted microwave, laser and bio sonic transmitters is being conducted. Bird tracking radar and methods of forecasting bird movements are also being investigated. Perhaps the most obvious method of dealing with the problem is being overlooked. Pilot education and timely reporting of bird hazards which can be translated back into operational mission planning. I'm sure that neither you nor I want to meet our end by a chance encounter with a feathered friend. ■

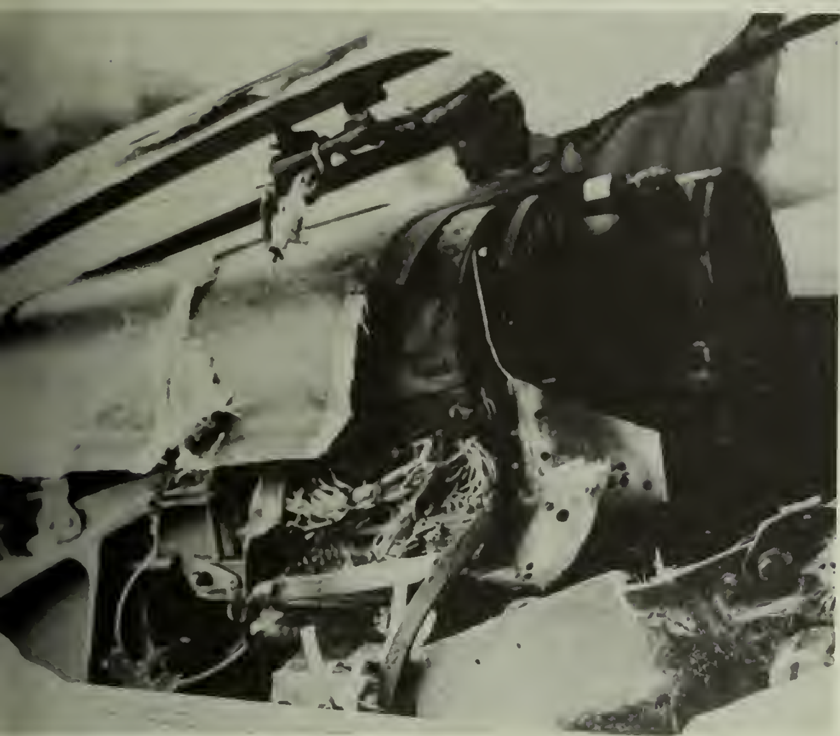
BIRDSTRIKE AT 480 KTS.

■ After a look at the photos on these pages, you might wonder if the pilot survived. He did— with some cuts and bruises. The mission was a low level recce flown at 480 kts and 500 ft AGL. Here's the FSO's description of the incident.

The pilot saw a shadow followed immediately by impact. There was a loud noise and jolt as the bird entered the cockpit followed by a loud buzzing and an increase in noise level and vibration. The bird hit the landing gear handle causing the gear to extend, struck the pilot in the left arm, chest, and helmet and continued aft knocking off the rear cockpit mirror. The bird struck the WSO in the helmet and, as discovered after landing, the bird and the mirror came to rest lodged in the banana links of the rear cockpit ejection seat. The WSO took control of the aircraft, began climb and slowed down so cockpit communications cou be regained. This procedure was briefed in the pre-missic briefing.

The pilot was able to take control after he made an assessment of the damages. The left front quarter panel w missing, the front windscree was shattered, most of the instruments on the left side the panel were either missin or broken and unusable and most of the front canopy was covered with blood, bird fles and feathers.

After inter-cockpit communication was reestablished and the pilot to control, he declared an emergency and requested a chase aircraft to check his gear. The gear indicated dow and locked and this was confirmed by the chase. Duri



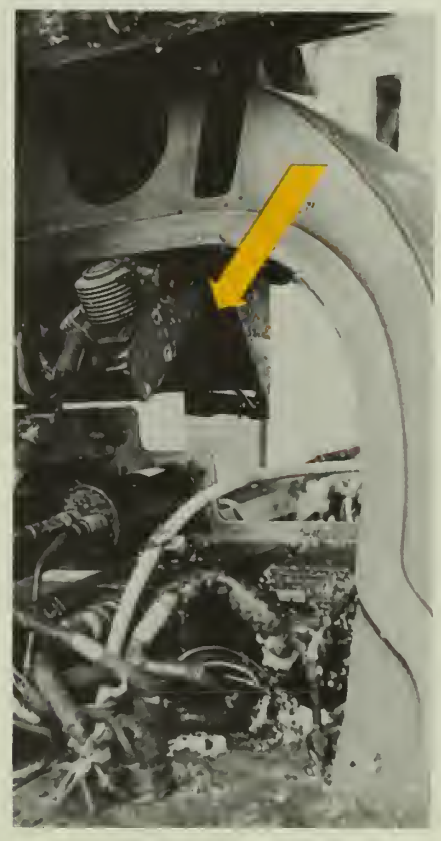
Far left, bird entered through left quarter panel. Left, instruments were torn out, gear handle hit causing gear to extend. Below, pilot's helmet; what if visor hadn't been down?

controllability check it was iscovered that the ground peed indicator was the only peed indicator working in the ont cockpit. The WSO called ut the airspeeds during the emainder of the flight.

Prior to the approach the yro and heading system failed o a no-gyro PAR approach as flown. The pilot was able o pick up the VASIs through e shattered windscreen about o miles on final and landed e aircraft. The aircraft was topped straight ahead on the unway and shutdown. It was en discovered that the rear ockpit ejection seat had been amaged. The fire department ut a hole in the rear canopy o egress personnel could safe e seat. The crew was taken to e hospital where the pilot as treated for minor cerations and abrasions of e left arm and contusions of e left side of his chest. vestigation revealed a bird as also ingested in the nr 1 ngine causing damage to the SD housing and minor amage to the engine. ■

Left, rear canopy hole cut by firemen. Below, destructive force of impact damaged many components.

NOTE: Command Selector Valve Has Been Torn From Its Mount.



Our thanks to Captain Mike Hambrick, FSO 363TRW for photos and narrative–ed.

REQUIEM FOR A HEAVYWEIGHT

By BLAKE C. MORRISON
Production & Design Mgr.
57FWW/DOWN
Nellis AFB, NV

She was called many things but THUD stuck. She could do it all, including a stint as the Thunderbirds' bird

■ The standard joke around the bar in the Officers' Club in the early sixties would go something like this: An F-4 driver would raise his voice and demand, "What's the sound an F-105 makes when it hits the ground?" Came the rousing chorus response, "THUD!!!" Numerous chortles, snickers and guffaws.

THUD.

That's one of the most respected names in the history of American aviation.

She was called a lot of things then — hyper-hog, ultra lead sied, ultra hog, Drop Forged Republic Aviation and a lot more names that are unprintable. No one ever cal the F-105 by her official nam "Thunderchief," except the press. She was one big joke early in that decade. That is, she was to all except those o us who flew her.

But, "THUD" stuck. And w Thud drivers just smiled a knowing smile and quietly continued separating the gin from the ice. We knew something the others didn't. She was one of a kind. She

as as stable as a Swiss franc
ıd she could hit. She could
t with the Gatling gun and
ıe could hit with bombs— lots
bombs. She had long legs at
w altitude. She was fast. It
as very easy to go fast with
ır— especially on the deck.
nd nobody else could go that
st.

Then we were presented with
etnam and we found out
me other things. From 1966
1968 she was THE one to
ırry the big iron downtown.
ıe wasn't exactly designed
r it, but Thuds hauled
venty-five percent of the
nash carried down Route
ack Six. And in combat, she
aintained a 90% in
ommission rate.

Maybe it was because she
as used to taking hits from
ıyone and everyone, for we
und out that she could take
her kinds of hits—the *real*
nd as well—and still fly. As
example, numbers 512 and
'6 (two dash tens) took direct
AM hits aft and came back
ome. So did number 167 (a
ısh five) return with the entire
ght stabilator shot off.

But she wasn't perfect. No
al lady is. She couldn't turn
orth a damn. We found that
ıt early on in USAFE any time
e tried to engage a Hunter or
Mark Six. We figured even a
isbee would outturn the Thud.
improve her chances in the
r combat arena, there was a
oposal in 1967 to upgrade
ach Thud by extending the
ings 18 inches, removing the
ıct plugs and displacement
ear to decrease weight,
creasing internal fuel
ıpacity by sealing the bombay
nd installing a larger tank,
creasing thrust by 5,000
ounds and adding other
ombat improvements. Ah,
hat might have been. She
ould have been a Super Thud.

And she didn't always come back. Her corpses line Thud Ridge, Hanoi, Thanh Hoa and a lot of other places up north. She wrote the epitaph for a lot of good men like Karl Richter. She died a lot. Over half the inventory was gone by the end of 1968— most lost in combat.

She became a legend and legends flew her: Robbie Risner, Karl Richter and Leo Thorsness, to mention a few. She was flown by other greats such as Dave Waldrop, Billy Sparks and Pete Foley. And she was handled by many unknown like Bob Gerlach, Jim Stiles and me.

As a Weasel she reigned supreme. She killed SAM sites, SAMs, MIGs and earned medals of honor for two men, Leo Thorsness and Merlyn Dethfelsen.

The Thud piled up thousands of combat hours on each bird and she was said to be weary and worn out. But ask any F-15 driver who tried to pace her at low altitude during Red Flag 80-2. It was, "Check twelve, Turkey, and I'll be waiting for you at the Club back at Nellis." She's the only bird I know that can give you "the bird" whether parked on the ramp, taxiing out or in-flight.

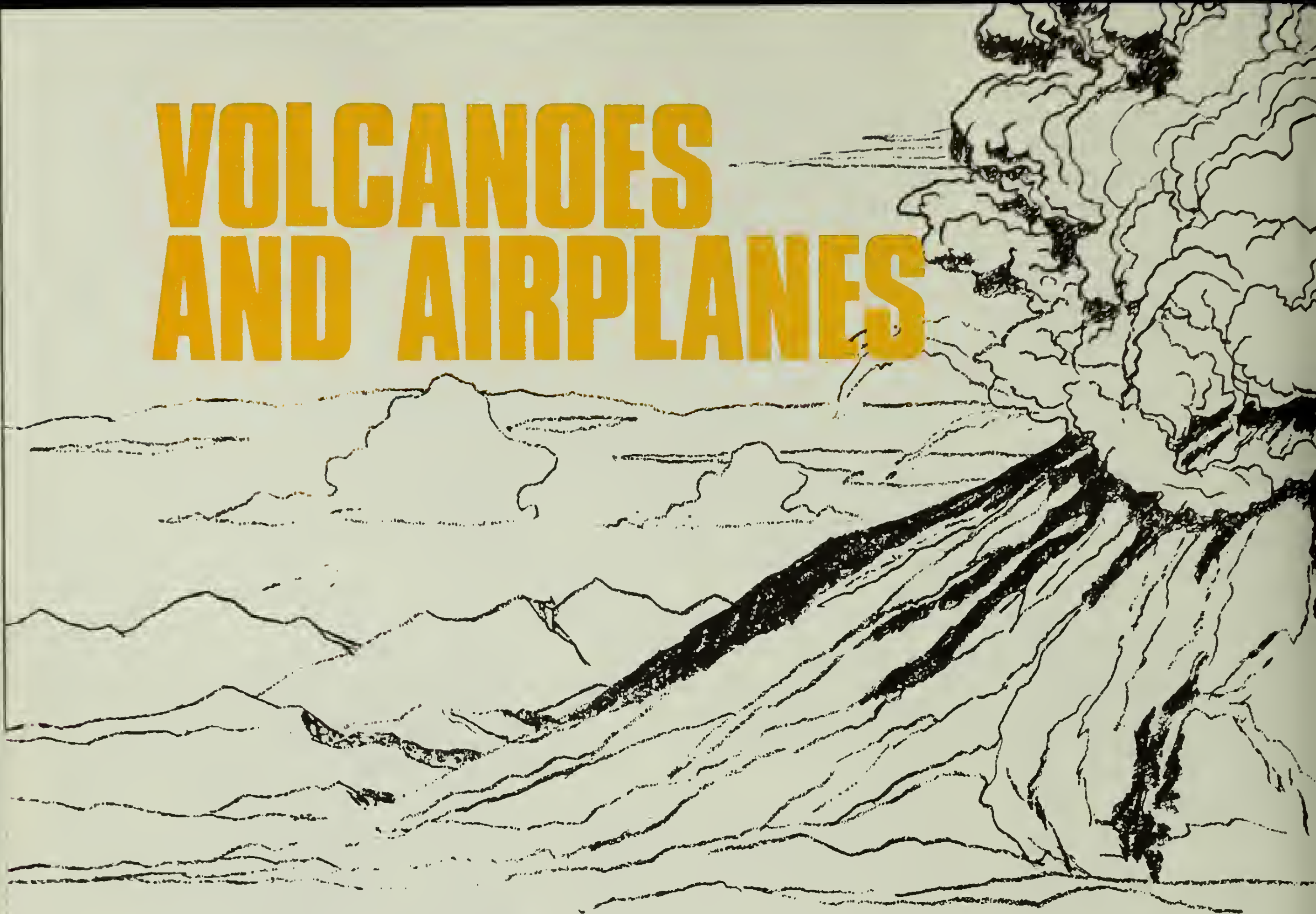
She entered the inventory on 26 May 1958.

On 12 July 1980 she made her last scheduled operational Air Force flight at George AFB. She goes on to the Guard and Reserve. But she stays with us as an American classic and a real thoroughbred. She could break your back but never your heart. She is genuinely loved by all who flew her and a lot who didn't.

The epitaph for a great American, "Feo, fuerte y formal," fits the F-105— "She was ugly, she was strong, but she had dignity."— Courtesy *USAF Fighter Weapons Review,* Summer 80, Issue 2. ■

An F-105 Camera caught this photo of another THUD coming off a bomb run on a rail line north of Hanoi.

VOLCANOES AND AIRPLANES



■ *The eruption of Mount St. Helens and subsequent spreading of volcanic ash over a huge area produced some serious problems for aircraft operation. The Boeing Aircraft Co published an informative paper, part of which is presented here. It's good information to keep on file. Who knows when or where the next eruption will occur?*

Composition

Samples of ash have been analyzed with the following results.

Abrasiveness	– High
Hardness	– Approximately 6 on the MHO scale / close to quartz
Texture	– Resembles talcum powder
Acidity	– Ground samples near neutral/PH 5.2 to 6.8/ . Samples taken at 55,000 to 65,000 feet indicate a PH factor of 2/highly acidic.
Toxicity	– None known to date
Corrosiveness	– Considered non-corrosive over short term but ash removal should be accomplished at earliest opportunity. Abrasive nature of ash can destroy leading edge finishes through erosion, thereby producing a corrosive situation.

Major constituents

Silicon	Aluminum	Potassium
Calcium	Iron	Copper
Oxygen	Titanium	Sulphur
Chloride		

Trace amounts – Fluoride

Particle size distribution/ground collected sample tak approximately 100 miles from St. Helens:

Under 5 microns	70 percent
5-15 microns	28 percent
15-25 microns	1.4 percent
25-50 microns	0.3 percent
Above 50 microns	trace amounts

Effect of Flight Through Ash Cloud

Two airplanes have been briefly exposed to the air borne dust cloud, where particulate concentration wa extremely high because of the proximity to the volca Post flight inspection showed similar effects in both cases:

All windshields pitted. One airplane required replacements

Engine fan blades pitted

All leading edges appeared etched or shotpeened

No corrosion

Exposure to Contaminated Runways

Ash appears to have high static charge. Observers reported that road traffic over this volcanic fallout generates dense dust clouds which are slow to settle. Similar effects can be expected on contaminated airp runways, making dust exposure inescapable. During

und operation where this material is present it will le on exposed lubricated surfaces and may penetrate ny conventional seals, enter the engine gas path and conditioning system, and may enter other orifices on airplane. In view of the potential adverse effects, ration out of airports with volcanic ash deposits uld be avoided if possible.

Certain recommendations were made including:

erations

imit reverse use as max reverse may impair bility, particularly at low speeds.

axi slowly with minimum power.

llow ash and dust to settle before takeoff.

Jse rolling takeoff.

Jse APU for starting only and not for air ditioning. Use filtered carts on ground if available.

Do not use windshield wipers for dust removal. Hose ash deposits and wipe off remainder with a soft th.

On B737 aircraft, vortex dissipaters must be operating used at all times on the ground and do not use ine bleeds for air conditioning when it is on.

Braking. Presence of a light layer of dust on runway t covers or obliterates markings could have a rimental effect on braking. The effect of a heavy er, or of dust mixed with water, is unknown. In lition, brake wear will be accelerated. Properly sealed rings should not be affected.

Maintenance

Check air, oil and fuel filters and generators and change oil more frequently.

Check pitot system for erosion, static ports and drain holes clear.

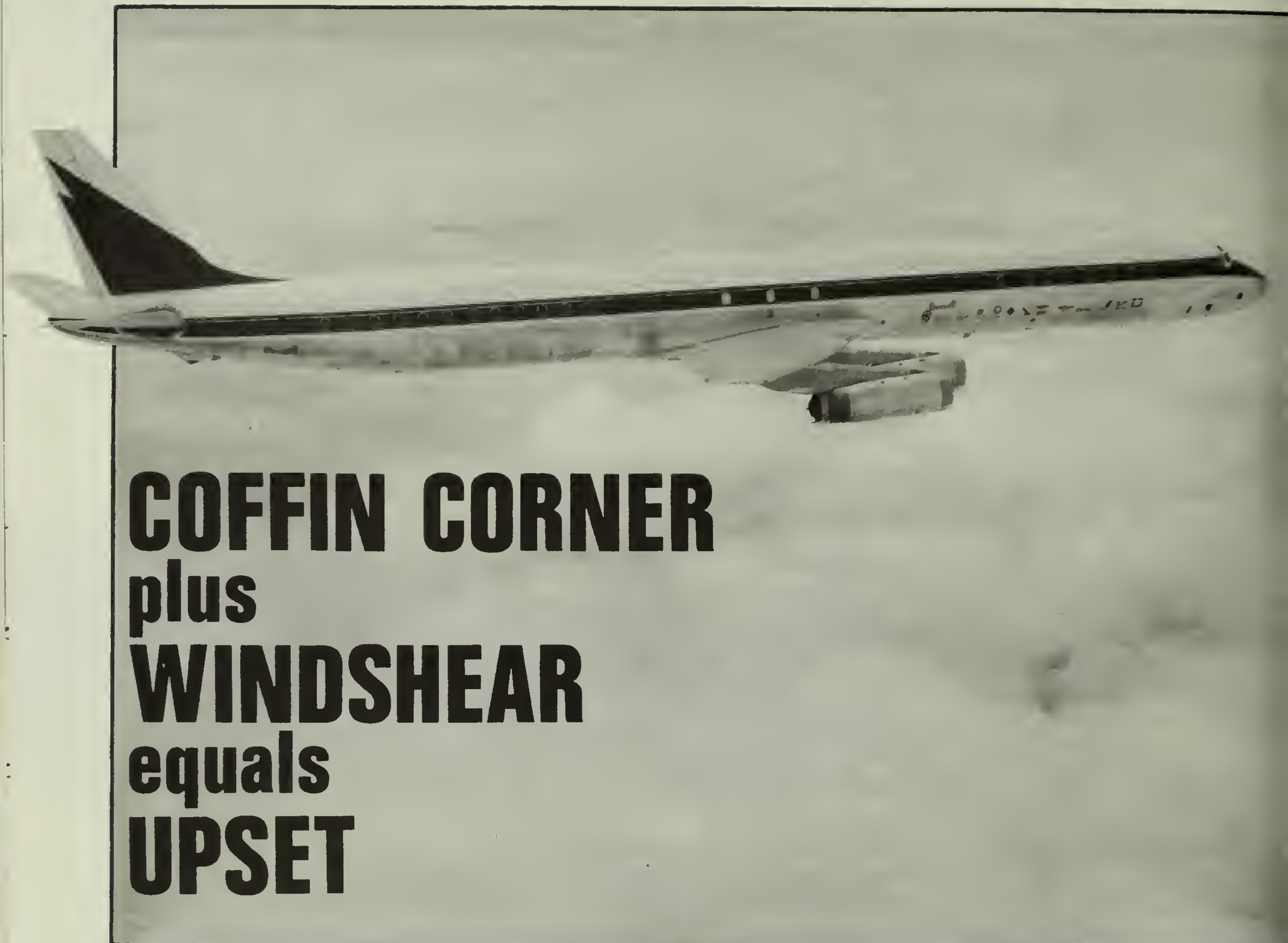
Surface contamination — to minimize abrasion, do not wipe, rub or walk on ash coated surfaces. Clean with water wash using alkaline detergent. Flood with water.

Due to the relatively high abrasiveness of the ash, increased wear rates of externally lubricated mechanism, e.g., bearings, ball nuts, jackscrews, control cables, etc., may occur. To minimize this exposure, relubrication of affected components should be performed at the earliest opportunity if ash has been encountered. Accumulated ash should be wiped off with a soft cloth. Use of solvents, particularly on control cables, should be avoided, as solvent may carry ash into areas where relubrication may not liberate. Remove ash from primary flight control balance panels, seals and hinges.

Physiological Effects

Some odor may be present in the cabin, however, no long lasting effects are anticipated unless some form of respiratory ailment is already present.

Minor eye irritation may be expected. Contact lenses should be removed. ■



COFFIN CORNER plus WINDSHEAR equals UPSET

Normally, when we hear "windshear" we think of low altitude-final approach type encounters. However, shear can occur at any altitude and cause trouble. Sometimes we call it CAT. Whatever, pilots should keep ahead of their aircraft and be prepared to counter the effects of windshear, wherever, as the event described in the following so strongly suggests.

■ During the outbound flight, light to moderate turbulence was experienced at different cruising levels, and information from the INS confirmed frequent changes in wind direction and velocity. In addition, the meteorological documentation as of 1800 GMT made available to the crew of a DC-8 before their departure from Buenos Aires carried an "Important Notice": *CAT between Buenos Aires and Curitiba (Brazil) from FL 300 and up to FL 390.*

The flight departed Montevideo at 1800 GMT with 130 persons, including eight crew members, aboard. It was cleared to Rio de Janeiro in accordance with a stored instrument flight rules flight plan. The assigned enroute flight level was 370. The flight was uneventful during takeoff, climb, and the initial part of the cruise at FL 370. After about 30 minutes flying at this flight level it was decided to request another flight level — FL 410 — due to light to moderate turbulence. Th "Fasten Seat Belt" sign had been switched on. Almost immediately after leaving FL 370 the clear air turbulence disappeared and flying a FL 410 was smooth and the "Faste Seat Belt" sign was switched off.

The flight continued for another 10 - 15 minutes with little or no turbulence, and the speed stabilized at mach 0.80. Keeping the speed stabilized incurred constant, minor adjustments of the power.

All of a sudden, the Captain noticed a very rapid increase in the speed and actually made a remark t that effect, leading to an observatio of mach 0.84 by all three pilots. As

e Captain put his hand on the rottles to make an adjustment, the itopilot disconnected without any arning and a violent pitch-up :curred. This maneuver was sociated with heavy airplane iffeting with a "settling" into the titude. Both pilots pushed forward

he decision to fly at FL 10 brought the aircraft 1 a vulnerable situation om an aerodynamic oint of view with regard) Stall and Buffet Onset peeds and atmospheric onditions.

1 the control columns having to ert considerable force. The cond Pilot standing behind warned ainst a too violent recovery. The imb was arrested at approximately . 420 and a descent towards FL 0 was initiated while the autopilot as re-engaged including the ltitude Preselect System.

At the time of the incident the IS wind was 310°/55 kt as opposed 270°/85kt just before the incident. ie pilots stated that the aircraft as at FL 410 before the incident d at FL 410 after the incident.

Shortly thereafter, the Air Purser me and informed about an injured ssenger, stemming from hitting e ceiling in the aft galley as he as walking from a toilet towards his seat. An additional passenger and a cabin crew member in the galley area, managed to secure themselves.

The decision to fly at FL 410 brought the aircraft in a vulnerable situation from an aerodynamic point of view with regard to Stall and Buffet Onset Speeds and atmospheric conditions.

The subsequent sudden windshear (270°/85 kt to 310°/55 kt) compared with a 056° heading of the aircraft resulted in a decrease of 55 kt tailwind component, thus creating an acceleration from mach 0.80 to 0.84 due to inertia.

A blow-up of the information from the Flight Data Recorder indicates in addition that positive vertical acceleration occurred at the time of the shear. The magnitude was only 0.2 to 0.3 G, enough under the prevailing conditions, however, to reach Buffet Onset Speed. The sequence of events was as follows:

Windshear

Longitudinal and vertical acceleration

Flow separation at the wingtips

Rapid, forward, movement of the center of lift

Automatic Flight Control system disengagement

Pitch-up

Recovery

The Automatic Flight Control system, and particularly the Pitch Trim Compensator, is not designed to accommodate for sudden forces as described above, which is the reason that the autopilot disengaged.

It appears in summarizing the factors that led to the pitch-up, that a less than desirable level of attention was paid to readily available information about:

Jetstream/windshear

Airplane gross weight versus altitude

Temperature deviations from standard

It is concluded that the cause of this incident was a windshear of a magnitude for which the autopilot was unable to compensate.

Contributing to the cause of the incident was the decision to operate the aircraft near its service ceiling through areas where windshears could be expected.

Recommendations were:

1. Flight deck crew members are instructed that a diligent utilization of all available information is of particular importance whenever they choose to operate an aircraft close to the performance limitations.
2. Flight deck crew members, in general, be furnished with knowledge during initial and subsequent training about the extreme care which must be exercised to prevent flight into the buffet boundary area. ■

—Courtesy *Air Safety Review,* July 1980

OPS topics

Wrong Barrier

■ An F-4 crew was completing a routine mission with an approach end BAK-12 arrestment. To make sure the aircraft was down well before the BAK, the pilot flew a low, dragged in approach and touched down 30 feet into the overrun. What they didn't realize was that there was an MA-1 in the overrun which was lowered but connected. The tailhook got the MA-1 from the wrong direction and pulled the chains three inches before the B cable failed. Fortunately, there was no damage to the aircraft. From this we can learn that

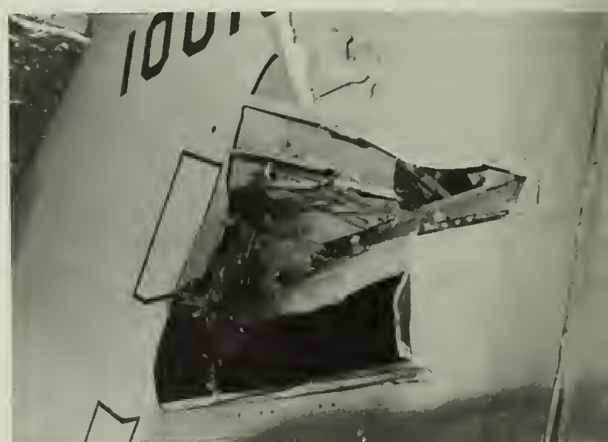
- F-4 crews seldom engage an MA-1 and, therefore, may not be aware of their presence.
- The status of the MA-1 was not relayed to the crew.
- Unless there is an emergency, the MA-1 should be removed for practice BAK-12 arrestments.
- Pilots should be made aware of the configuration of the runway, i.e., location of all barriers.
- Controllers should inform pilots of barrier status.

UFO

A bullet, a rocket, superman . . . a tank?? That's what the crew reported – a tank. According to the fighter crew, the AC was looking out to the left when the WSO asked him to check 12. Both then saw what appeared to be a silver drop tank 30 to 40 feet long. The pilot made a hard left break and the object passed some 50 feet to the right. They reported the event to radar which did not pick up the object. Now the plot thickens.

- No such dropped object was reported.
- The crew did not perceive a downward vector of the object. In fact, they weren't sure it was falling, or even moving.
- The occurrence did not coincide with a scheduled weather balloon release.
- It's characteristics were not that of a weather balloon.

What the object was has not been determined. Could it be . . .?



A Kick In A B-52 Tail

That hole in the vertical stabilizer of a B-52, shown above, was caused by a lightning strike. It's about 6 x 6 ft. and the other side of the stabilizer had a 3 x 3 ft. hole.

The aircraft was on a routine training mission which included low level navigation on an IR. The weather was forecast as isolated thunderstorms. An hour after launch, a Metwatch was issued for 80 percent POLC (probability of lightning conditions) on the IR effective 1200L. The pilot could see they were approaching a steadily lowering ceiling with associated rain showers and elected to discontinue terrain avoidance and climb to IFR altitude (9,000 feet).

About 30 seconds after entering the clouds, the crew saw a bright flas[h] front of the pilot's wind[ow] which they took to b[e] lightning strike on [the] radome. Simultaneous[ly] they felt a jolt and hea[rd a] loud bang.

The navs reported [that] radar mapping was lost, [and] the pilot immediat[ely] notified the RBS c[on]toller that he was abor[ting] the low level. Prior to [the] incident, the navigat[or,] who had been radar sc[an]ning ahead, saw no we[ath]er returns indicati[ng] thunderstorms.

After the aircraft land[ed,] damage to the verti[cal] stabilizer was discove[red.] Those are big holes. F[or]tunately, though, th[ere] was not enough damag[e to] fail the stabilizer.

y Some Insurance:
a NMAC

\mong the several Haz-
ous Air Traffic Reports
ATRs) and Near Mid-
Collision Reports
MACs) filed nearly each
are some that should
ch us something. For
ample, you may not
w that the controlling
ncy may not track that
craft that nearly ran into
unless you report the
r miss and state that
intend to file a NMAC
idea is that if the other
craft and pilot can be
ntified, it makes it pos-
le to counsel the pilot if he was creating a hazard unknowingly. An example of this situation was a civilian instructor pilot new to the area. Within minutes, he managed to cross the final approach at an AFB twice with our aircraft on final. In each case, the miss distance was small enough to be a hazard if the USAF pilots hadn't seen him. He was identified and the FBOs at the nearby airport have made a special briefing for civilian pilots.

ws and Controllers
ke

C-130 pilot, with one
ine out, declared an
ergency. Center asked
e needed any special
dling and the pilot said
just normal emergency
onse. Center informed
roach control that the
t didn't need any assist-
e at his destination.
roach control advised tower that the pilot cancelled his emergency. While on short final, the C-130 was sent around for spacing behind another arrival. Center had passed erroneous information to the terminal facility, further aggravating a potentially serious emergency. Lessons learned: verification of inflight emergency status is the responsibility of both *aircrews* and *air traffic controllers*. — Lt Col Nicholas O. Gaspar, Directorate of Aerospace Safety.

Aero Club Mishaps

A couple of aero club mishaps provide us with some grist for thought about how not to do it. One member in a Cessna 172 parked behind another aircraft at the fuel pit. He was about to chock his airplane when the other attempted to taxi with chocks still installed. In trying to help the other pilot, he left his airplane unchocked. A prop blast from nr 1 caused nr 2's airplane to roll down a gentle ramp — backwards. The airplane rolled into a chain link fence and received some damage. His concern for the other pilot was laudable but not at the expense of his own aircraft.

* * * *

Another aero club pilot got into trouble in the same way many others have done. Weather was bad, the flight plan VFR but some actual instruments were flown. The weather blocked out the flight and caused extensive detours that led eventually to a forced landing (out of fuel) in a farm field. Fortunately, neither pilot nor passenger was injured and the aircraft was flown out next day by another pilot. Be brave! Don't be afraid to make a 180.

Hot Cockpit

During descent to base on a cross country, the pilot of an F-106 noted the canopy defog system to begin operating without the switch being used. At the same time he saw a bit of smoke in the cockpit and his eyes began to burn. Despite all efforts, the hot air flow through the canopy defog system continued. The pilot declared an emergency and was given vectors to his base. However, on his first two landing attempts he had to go around because eye irritation degraded his vision. He landed safely on the third attempt, was met by the flight surgeon, treated and released. The canopy defog valve had an internal short which caused the valve to fail in the full open position. Even with cabin temperature at full cold, this condition could cause intense heat in the cockpit. ■

X-COUNTRY NOTES

By MAJOR DAVID V. FROEHLICH
Directorate of Aerospace Safety

■ First, a small commercial message! We're winning— this trip we visited places for the third time in two years. Generally, the places on the Rex Riley list had certificates hanging proudly on the wall, and they displayed helpful attitudes to match! Places not on the list were obviously several steps below. Shabby facilities, out-of-date pubs, missing forms and generally lackadasical folks helped to restore our faith in the list. One comment made our day: "You know, the Rex Riley Program is the common denominator. Maintenance owns TA, Ops owns the airfield, the base owns transport/billeting/inflight. The point is that Rex Riley is the one cause or program that all the agencies can relate to and get behind. The Rex Riley Award is an excuse and good reason to talk to one another and cooperate to provide outstanding, safe service to transient aircrews."

Thanks, we needed that! The only thing I'd like to add is that Rex is also a super sounding board for all the players. We love to pass on complaints, kudos, or ideas from crews, Ops, TA or anyone involved.

INFORMATION

CREWS— We still can't work up a lot of sympathy when you write in and complain about a bad turn or bad service when you dumped a flock of transients on a base with no notice. Rarely is there an occasion when you can't call PTD (or somebody) at least 30 minutes out to let them know you're inbound. It's preferable to use the phone a day or several hours in advance, but at least call the Base Ops folks on the way in. No excuse!

We want to remind you that we blue suiters also operate under a certain number of FAR's and FAA rules besides the myriad of Air Force books we are bound by. The point came home as we watched a covey of eagles arrive at a joint-use field. The tower became noticeably testy as the four-ship took awhile to clear their only active as one of the proud birds was on short final. Word to the wise— you play "you bet your wings" when you enter that environment and, again, a call ahead might grease the arrival. Don't be unsafe, but don't dally either because to those folks time is money, and often they are quite sensitive!

OPS— Reflection time. When was the last time (other than CFI) that you took a good look at the paint in your facility, sharp edges on counters, lights burned out in the flight plan room, forms available, AUTOVON availability, handy u phone numbers, airfield diagram, NOTAM hourly updates, grass length around runway remaining markers, paint lines on runways/ taxiways, etc.! That's a capsule o the last trips write-ups.

Empathy time. Aircrews come all sizes, shapes, numbers, colors and sexes. Step back and take a l to make sure your services and facilities are adequate and set up the single-seat driver *as well as* t multi-place transports with 7 - 9 folks with a variety of requiremen

Review time. Also, step back a take an empathetic look at the tot FLIP package for your airdrome. Check the amount and clarity of i you have in the IFR Supp, A/P 1 letdown books, SID's, etc. Especially, take a hard look at th confusion factor with operating hours vs TA available hours, daylight vs standard time, pattern altitudes, entry instructions, and contact instructions/frequencies. A lot of info may have to be digeste in a hurry, so the fewer confusion traps, the better!

RETAINED AWARDS

MATHER AFB— High density traffic area, so look out! Good facilities and service. Variety of aircraft makes this another place t pay close attention to patterns,

ıing, and parking.

MAXWELL AFB — TA folks are standing! Service and facilities ke this a good stop or stay. nways a little short for some of on those hot and/or wet days.

ANDREWS AFB — They still have ne priorities and procedures ich boggle the average aviator's nd. They appear, however, to still trying to mesh their problems h generally good service for nsients. Save some extra gas for htseeing vectors in the shington area, and save an extra ıcil to copy your departure tructions. Send Rex your eriences and thoughts regarding drews.

OFFUTT AFB — Another location h priority traffic that still does a od job for transients. The more ice you can give Base Ops, the ter service you're going to eive. I reinforced my respect for ding on 12 with a stiff X-wind ough the buildings. Don't be prised!

PATRICK AFB — Folks down there really trying to take good care of nsients. Quarters, TA, and Ops ks are super. Lots of coastal little plane flyers make an eyes-open ival a good idea.

RAF MILDENHALL — We had a er report on these folks. Base s and especially TA were singled as being top-notch players, and (, quarters, transport, and food ilities were all excellent.

D GUYS

BASE X — Under the plexiglas on flight plan table was a one nth out-of-date H-1/H-2, H-3/H-4. Goes with the attitude.

BASE Y — A new, neat, and clean Ops counter, but total disorganization and confusion behind it. Billeting — we stood (along with eight other folks including an 0-6) for 25 minutes while the five ladies behind the counter accomplished a shift change and inventoried the soft drinks and razor blades. Other places do it smoother!

BASE Z — We had a small maint problem which would require a specialist, a part, and 10 minutes! We called 150 miles out and passed the details and request thru Base Ops. Everyone (Ops, TA, job control, supply, etc.) dropped the ball and our stop took 3½ hours. The flight plan area is still a dungeon, and the dispatchers still don't care.

ALMOST UNMENTIONABLE — We've watched for two years and still see negligence in the TA operation, late and incorrect service by Fleet and PAX services, non-sympathetic billeting personnel, and confusing and hesitant air traffic service. Lack of interest!

End of report! We care and hope to help, but crews and players can help too with a X-feed of information. Write REX RILEY, AFISC/SEDAK, Norton AFB, CA 92409. Fly smart! ■

THE

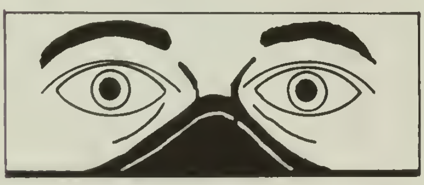
REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter SC
LITTLE ROCK AFB	Jacksonville, AR
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso FL
DOBBINS AFB	Marietta, GA
RAF BENTWATERS	UK
RAF UPPER HEYFORD	UK
ANDERSEN AFB	Guam
HOLLOMAN AFB	Alamogordo, NM

BUT I THOUGHT...

In July we published an article from the Navy's *Approach* magazine on the subject of illusions flyers are susceptible to. It was one of an excellent series by Commander Voge. Our experience during the past year or so indicates that our crews could benefit from the following article by Commander Voge on various forms of disorientation. She will tell you all about *target fascination* or *fixation, breakoff phenomenon,* and the *autokinetic phenomenon* or *visual autokinesis.*

Many of the various forms of disorientation simply are due to a lack of attention on the aviator's part. Never happen to you? Don't be so sure! Think back. Whenever we fail to make 100 percent utilization of the inputs in our surroundings, we are subject to this phenomenon.

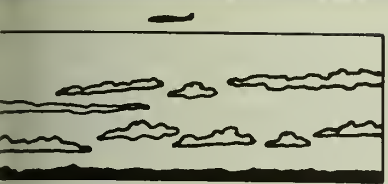


FIXATION: Either boredom or too much attention to a single detail or an aircraft malfunction can bring us face to face with this problem! There is a constriction or narrowing of our field of attention, and we fail to perceive significant and relevant information. (Remember when we were talking about vertigo, the problem was a *misperception*.) When we talk about *fixation* or *fascination*, we simply mean that we fail to respond adequately to a situation, even though we are given all the necessary inputs and know perfectly well what our response should be.

Did it ever happen to you? You betcha! You probably just wrote it off as daydreaming, or perhaps complained that there were just too many things to do at once, or perhaps that the task at hand was too exacting and you had to really concentrate on it. Perhaps it was a certain instrument you were concentrating on, or your aircraft had a malfunction that drew all of your attention to the detriment of all else. This is not always visual. For example: Consider an aircraft coming in for a landing. The pilot is 50 feet too low. The NFO warns the pilot, even screams at him—no response. The aircraft lands short. Similar fixation occurs occasionally on carrier landing approaches. We admit that the most common culprit is the student aviator. He is usually stressed, and he frequently allows his attention to fixate on one instrument, point in space, maneuver, etc. to the exclusion of all else. You more experienced pros have developed a regular scan so that you constantly and consistently know all aspects of your aircraft's performance and behavior. Right? Of course! Except as mentioned above, when you are bored, or when your workload becomes too great, or when you're anxious. You actually become less efficient. Your copi[ng] mechanisms fail, and your performance slides. You concentr[ate] on only a few instruments, like airspeed, and forget to check altitude. The low altitude horn comes on loud and clear, but you don't hear it. You're too engross[ed] in the job at hand. As you might expect, this happens most freque[ntly] during instrument flight, but not always.

TARGET FASCINATION: [...] aviator may become so engrossed [in] hitting the target, during a bombi[ng] run or a rocket attack on a groun[d] target, that he completely forgets [to] pull up until very late, if he wak[es] up at all! Ridiculous? Wrong! Th[is] was a suspected causal factor in more than a few major mishaps t[hat] we reviewed here at the Safety Center last year. It is felt that su[ch] things as fatigue, hypoxia, hangover, medication/drugs, and personality factors may contribut[e to] the problem. This phenomenon is difficult to prevent, although keeping oneself physically fit an[d ...] *guard* may help. When you do fe[el] as if you're suffering from this problem and you're in a fixed-wi[ng] aircraft, first check your oxygen equipment, just to make sure you['re] not hypoxic, then take it from th[e]

CDR V. M. VOGE, MC
val Safety Center



EAKOFF HENOMENON: The *breakoff enomenon* usually occurs only at her high altitudes (30,000 feet or gher). It is often described as a ird feeling of detachment, lation, remoteness, and separation m the earth and from the aircraft. e feels as if he has broken the ysical bonds of earth, or as if he being balanced on a knife edge. casionally, the aviator may feel t he is outside his own aircraft d body, watching himself fly the craft. This manifestation plagues experienced aviator during long, itary, routine missions with a nstant heading. A poor horizon d lack of visual clues of external tion facilitate this illusion. The k blue sky frequently merges h a uniform cloud cover. This sion is not the exclusive domain you high-altitude jet jocks, wever. Helo drivers have cribed very similar sensations ile flying as low as 500 feet over uninteresting seascape, in hazy nditions.

The *breakoff phenomenon* is a ner frequent illusion. About a rd of you subjected to these nditions will admit to eriencing it. Most of you cribe the feeling as pleasurable, l part of the joy of flying. About ird of you, however, do not reciate it. You complain that it makes you nervous and is disturbing. Your performance may be adversely affected by your anxiety state. You may have an increased awareness of any change in aircraft attitude or motion. A 5-degree bank may feel like 30 degrees, or you may feel as if you're rolling or banking when you are actually straight and level. You may feel as if you have no visible means of support— that you will literally fall out of the sky.

The sensations involved in this phenomenon are usually very short-lived, and you will rapidly return to reality when you descend, change altitude/attitude, or when your attention is directed to some task at hand, i.e., heading change, comm, cockpit checks, etc. Infrequently, an aviator will require some sort of ground or cloud reference, something that will give relative motion cues, in order to bring himself back to reality.

AUTOKINETIC PHENOMENON: The fourth illusion is the *autokinetic phenomenon*, or *visual autokinesis*. Remember way back when you were in the training command and you were put into a pitch black room— all the lights were put out, except for a lone pinpoint light. You were told to watch the light move, and try to remember its path. Of course, we all were surprised to find, after about 15 minutes of watching the light go up and down and all around (wandering rather aimlessly), that the light was fixed. The movement was imagined, all in our head (or eyes in this case). The illusion appears to be due to the changing tension in our neck muscles and/or a certain degree of fatigue in our eye muscles. The featureless background does not give us enough information about the involuntary eye movements that we are experiencing to be able to compensate. We interpret these movements as movements of the light. This phenomenon is one of the reasons ultraviolet instrument lighting was abandoned in cockpits. The glowing phosphorus against the background of a black cockpit or instrument panel provided the necessary conditions for this illusion. When are we subject to this illusion in the real world? It is most frequent during night formation flying, especially so when only one running light can be seen on the lead aircraft. You may have difficulty distinguishing between the real and apparent movements of the leader. How do we fix this one? There's no good way. The addition of more, bigger, and brighter lights to the background will help, but this isn't always operationally feasible.

As you can see, the *fix* for disorientation phenomenon is not as cut and dried as with vertigo. About the only thing we can recommed here is to keep physically fit and alert, keep changing your points of reference, and don't fixate.— Courtesy *Approach*, August 1980 ■

The  Bac

■ There's a phone in the Pentagon that is connected to all the major Air Staff offices — some call it THE BAD NEWS PHONE. If you're rated, and working anywhere near this phone, you can't help but become intimately aware of its existence. Those of us who are fighter jocks ought to be especially knowledgeable of it since it is our number that's often called.

What's this, another scare tactic? No, it's not. What I am about to say covers some facts the average aircrew member probably doesn't fully comprehend. With all the safety jargon and information that comes our way in the squadrons, it's hard to keep it all in perspective, to know exactly where we stand. This article is one man's attempt to relate the lessons learned after spending a year answering the "bad news phone."

Specifically, this phone is a gray "Ma Bell special" connected to the Air Force Operations Center. It is used to relay information on any significant Air Force aircraft mishap. I hadn't been assigned to the Office of The Inspector General two weeks before it rang three times in one day — three fighters were destroyed and four aircrew members were killed. And that wasn't the only time it rang more than once on a single day. In 1979, it rang *94 times* for Class A mishaps.

Before coming to the Pentagon, I had been flying F-4s in USAFE and had never really been aware of how many aircraft the USAF loses a year. Here are some of the hard facts that hit me after coming from a line unit to the Air Staff.

Mishaps

When you consider that in 1950 we had 1,744 major accidents, the figure of 94 Class As for 1979 does not seem high. The USAF has made tremendous progress in reducing mishaps over the last three decades, but fatalities still occur and those people can never be replaced. Here is the record over the past 10 years:

The downward trend seems to have leveled off. So far in 1980 there is good news. As of 30 Ju 1980, the USAF had a 2.1 Class Mishap rate. The "phone" has relatively quiet this year, althou rang many times in July. Let's h it stays quiet the rest of the year

Operational Mishaps

As the USAF becomes more technologically advanced, increasingly it is the pilot who i weak link in the man/aircraft interface. Functional limits *"are longer dictated by structural considerations or by hardware limitations, but rather by the physiological and musculo-skele tolerances of the crewmen."* (AFISC/SEL) That insight leads the next pointed realization.

An operations mishap is due primarily to pilot factor (i.e., midairs, control loss, flying goo aircraft into the ground, etc.). It an eye opener to learn that in 19 operations mishaps accounted fo

Year	Major Accidents/Class A Mishaps Number	Rate/ 100,000 hrs	Total Fatalities Number	Ra 100,00
1970	200	3.0	334	5.
1971	141	2.5	129	2.
1972	163	3.0	163	3.
1973	102	2.4	90	2.
1974	108	2.9	98	2.
1975	93	2.8	281	8.
1976	87	2.8	116	3.
	Major A/C Acc.	Class A Mishaps		
1977	90	2.8	89	2.
1978	98	3.1	89	2.
1979	94	2.9	77	2.

News Phone

y CAPTAIN JOHN BARRY • HQ USAF/IGF • Washington, D.C.

ercent of the destroyed aircraft. ven more worrisome was that ghter/attack aircraft contributed the iajority of these destroyed aircraft 75 percent) while flying pproximately 30 percent of the SAF total flying time. This is not nique to 1979. Statistics show that ie number of operations-related iishaps has steadily *increased* since 977 and is primarily driven by ghter/attack mishaps:

	1977	1978	1979
otal Operations Mishaps (All USAF Aircraft)	51(100%)	64(100%)	68(100%)
perations Mishaps (Fighter/Attack)	29(56%)	35(54%)	51(75%)
otal Fighter/Attack Hours Flown	923,891	916,940	951,283

This is not just a safety concern. lishaps are extreme consequences f deficiencies that are highly visible ecause of the obviously destructive nd costly results; but, what of the ss visible degradations to combat eadiness?

ut-Of-The-Envelope Ejections

As the "phone" would ring week ter week, I started paying attention how many aircrew members were ecting safely out of aircraft. After little research, I noticed there was adverse trend in out-of-the-velope (O/E) ejections. Since 976, there has been an increase in e number of ejections and a orresponding decrease in ejection urvival rates, primarily due to O/E ejections. In 1979, 79 USAF crewmen ejected, the ejection survival rate was 68 percent, and there were 25 ejection fatalities. Nineteen of these fatalities ejected O/E. It is true that many were operating in an environment which did not allow much time for assessment of the problem and ejection decision, but evidence indicates that seven of the 19 O/E ejections in 1979 involved unnecessary delays of 5 seconds or more. Timely ejection decisions probably would have increased the survival rate. This adverse trend has continued in 1980. As of 31 May 1980, there have been 25 ejections, 11 fatalities, and 10 of the 11 fatalities were O/E. That figures to be a 56 percent ejection survival rate, the lowest in five years. Here are the last five year's statistics:

EJECTION SURVIVAL RATES
1976 - 1980

Year	Total	Survived Number	Percent	Fatalities O/E	Other
1980 (As of 31 May)	25	14	56	10	1
1979	79	54	68	19	6
1978	79	63	80	11	5
1977	70	54	77	12	4
1976	64	50	78	8	6

With more realistic training and flying in less forgiving environments, we fighter jocks must be prepared for the split-second decision-making necessary to avoid O/E ejections. During peacetime, the ground is our enemy.

The observations that I've made in this article are not earth-shaking revelations; in fact, most of what has been written here has been disseminated throughout the Air Force. However, the intent was to put some of the mishap information in perspective so that others like me might have a better understanding of where we stand. It's not the "big picture" but it may serve as a quick glance. My next tour is in fighters again, and beside trying to be the most combat-ready fighter pilot in the USAF, I'm going to ensure I'm not a conversation topic on the "bad news phone." ■

About the Author

Captain Berry is an honor graduate of the Air Force Acacemy, 1973, and spent six years as a fighter pilot before being assigned to the Office of the Inspector General in an ASTRA assignment. He was an instructor pilot in the F-4E, test pilot in the Imaging Infrared Maverick Missile Program and William Tell pilot during the Worldwide weapons meet at Tyndall AFB in 1978.

Good Instruments= Good Insurance

By BRIGADIER GENERAL LELAND K. LUKENS
Director of Aerospace Safety

■ Over the last 19 months, we have experienced 13 Class A mishaps where instrument conditions were involved. Twelve of these were fighter/attack/trainer mishaps. These unfortunate and unnecessary losses cause me deep concern, so I want to pass some of my thoughts along to you, the flyers, in hope that they may help.

Three problems were players in one way or another in these mishaps. First, the pilot found himself in an unusual attitude and either did the wrong thing or did nothing until it was too late. Second, for some reason the pilot was distracted and did not pay attention to what the gages were telling him. Third, the pilot apparently made an instrument procedural error, placing his aircraft in an unusual position and could not recover.

We old timers remember the concentrated doses of instrument training we received back in primary and basic pilot training. It was hard, dedicated instrument work but necessary for survival in single seat fighters. Simulators, then as today, played a part in training programs and although they cannot compare with actual flying time, there is no doubt that they have some value. They are good for increasing instrument proficiency, so use them when available and work that crosscheck.

In the good old days in combat crew training at Luke, the first thing an F-100 upgrading pilot did was spend about 20 hours under the bag in the back seat of a T-Bird before he ever climbed into an F-100. Then about halfway through his fighter checkout, he returned to the instrument squadron for 9 more hours of concentrated instrument work under the hood in the back seat of the F-100F.

With the present cost of JP-4 and other flying time constraints, I'm afraid those days of postgraduate level instrument training are gone forever. Unfortunately, the requirement to fly precision instruments is with us today more than ever. Today's fighter pilot is flying higher performance all-weather systems and more night low level than ever before. The best way to ensure your proficiency is to take advantage of every "spare" moment of flying time available to practice basic instrument approaches and procedures. Practice your crosscheck. Be critical.

Demand a precision performance of yourself. It's good insurance and when the time comes that you need that proficiency— you'll have it. ■

☆U.S. Government Printing Office: 1980—683-214/12

STATES AIR FORCE

Well Done Award

Presented for

anding airmanship

d professional

formance during

zardous situation

and for a

cant contribution

to the

States Air Force

cident Prevention

Program.

Captain

Jon A. Bisher

4018th Combat Crew Training Squadron
Carswell Air Force Base, Texas

■ On 25 January 1980 Captain Bisher and his instructor crew were flying a CCTS crew training mission in a B-52D with a student crew and had returned to Carswell to accomplish scheduled local transition training prior to the final landing. After approximately one hour of routine pattern work, Captain Bisher had his student pilot practice a flaps up approach. Following this approach, Captain Bisher, occupying the copilot seat, took control, entered the visual pattern, and configured the aircraft for a normal, full stop landing. Control was then returned to the student pilot to make the landing. While the aircraft was turning from base to final, Captain Bisher began to "sense" an excessive sink rate even though the student pilot was flying the correct airspeed at the time. Not knowing exactly what was wrong, but certain that something was seriously amiss, Captain Bisher took control of the aircraft and executed a go-around. The aircraft was approximately 500 feet above the ground when the go-around was initiated. Constantly changing stabilizer trim requirements and accompanying airspeed changes soon led to the discovery that the wing flaps were cycling without command between the full down and the full up position. Because of the large Fowler flaps on the B-52, the difference in flaps up and flaps down stall speed is approximately 30 kts. Had Captain Bisher not acted promptly turning final he would have ended up below his stall speed with insufficient altitude to recover. His recognition of the situation was even more notable because he was not actually flying the aircraft. After reaching safe altitude and airspeed, the normal flap control circuit breaker was pulled when the flaps reached the full down position. This removed power from the flap circuitry and the flaps remained full down. A normal full stop landing was made without further incident. Post flight inspection revealed FOD in the flap control actuator which would not allow power to be removed from the "up" side of the actuator. This allowed an uncommanded flaps up signal to be sent continuously to the flap drive motor. Had Captain Bisher not felt or sensed an abnormally high sink rate and taken immediate corrective action, a catastrophe most likely would have occurred. He clearly demonstrated superior professionalism and airmanship throughout this emergency. WELL DONE! ■


MILITARY AIRLIFT COMMAN

44:

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

NOVEMBER 1980

For Eagle Drivers Only

see page 14

flying
SAFETY

By BRIG GEN LELAND K. LUKENS
Director of Aerospace Safety

■ 1944 was a watershed year for the U.S. Army Air Force. Its planes and crews were doing their share in driving back the Japanese. The Greater East Asia co-prosperity sphere was about to collapse.

Europe was invaded; by the end of the year, B-17s, B-24s, B-25s and B-26s were bombing the enemy at will protected by the greatest fleet of fighters ever assembled.

1944 was a good year for American military aviation, but there were

16,128 major aircraft accidents
1,963 fatal aircraft accidents
4,793 fatalities

for a major aircraft accident rate of 45 per 100,000 flying hours. These figures were for CONUS accidents only.

Flying safety then as now was the responsibility of commanders. However, they had no safety staffs such as we have today. The safety program consisted primarily of instructors and squadron commanders telling their crews to be careful. Occasionally, the crews would get a lecture in the theatre.

There were some rather feeble attempts to issue printed "flyers" that were distributed to places where crews congregated, but they were few and issued on an "as needed" basis. "As needed" meant that there were too many accidents—too many being an arbitrary figure—and something had to be done.

With the number of accidents reaching an intolerable height, Air Transport Command (ATC)—which has since become MAC—established in December 1944 the first periodical issued on a regular basis and dedicated to preventing aircraft accidents. The new magazine was titled *Flying Safety Journal*.

Its importance to ATC was emphasized in a 1946 letter of justification for continued publication of the *Journal*, from ATC to the commanding general of the AAF. The magazine was credited with a large role in saving $41 million and 401 lives from mid-1944 to mid-1945. The rate dropped from 46 to 29 in ATC.

The impact of the *Flying Safety Journal* was not on the Air Staff, and in 1947 the magazine gained fu status by becoming the official Army Air Force fl safety magazine. According to AAF Letter 62-8 o August 1947, "1. *Flying Safety* a new monthly r azine, is being published by this Headquarters (Fl Safety Division, Office of the Air Inspector). The pur of this magazine is to communicate ideas, techniques, suggestions which will aid in reducing the AAF acci rate."

Distribution was to be worldwide and flying sa officers were encouraged to use it as a source of dis sion material at safety meetings. ". . . The maga exists for the benefit of all and can best accomplis purpose when everyone contributes to its conten The number of copies was increased from 4,000 to 20, Subsequently, after the establishment of the Departr of Defense and a separate Air Force, *Flying Safety* came an Air Force periodical.

In 1960 two forces combined to change the title o magazine. Missiles were coming into the inventory the Ground Safety Division had moved to Norton and had become part of the safety directorate. Publ tion of ground and missile safety material was comb with flying safety in one magazine—*Aerospace Safet*

Now that the magazine is once again devoted enti to flying safety, it is appropriate to change the title to flect that. Therefore, effective with the January 1981 is the magazine will once again bear the title *Flying Sa* magazine. Its mission: mishap prevention through edu tion. It is intended for aircrews, their commanders supervisors, and personnel in direct support of fl operations. We solicit your contributions and promis provide the best material possible in each issue. We confident the magazine has contributed to some degre the reduction of the 45 major accidents per 100,000 ing hours in 1944 to the 2.5 rate we are experiencin date this year. That's the name of the game as well a the magazine. Fly safe! ■

NITED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

OVEMBER 1980 AIR FORCE RECURRING PUBLICATION 127-2 VOLUME 36 NUMBER 11

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

SUBSCRIPTION—AEROSPACE SAFETY is published monthly and is available on subscription for $17.00 per year domestic; $21.25 foreign; $1.50 per copy, domestic; $1.90 per copy, foreign, through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. Use of funds for printing the publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payments can be made for manuscripts submitted for publication in the AEROSPACE SAFETY Magazine. Contributions are welcome as are comments and criticism. Address all correspondence and, Postmaster: send address changes to Editor, AEROSPACE SAFETY Magazine, Air Force Inspection and Safety Center, Norton Air Force Base, California 92409. The Editor reserves the right to make any editorial change in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from AEROSPACE SAFETY without further authorization. Prior to reprinting by non-Air Force organizations, it is requested that the Editor be queried, advising the intended use of material. Such action will ensure complete accuracy of material amended in light of most recent developments. The contents of this magazine are informative and should not be construed as regulations, technical orders or directives unless so stated. Authority to publish this periodical automatically expires on 26 Jan 1982, unless its continuance is authorized by the approving authority prior to that date. Distribution: 1 copy for every 2.5 aircrew and aircrew support personnel.

Ice, Snow & 10 Below

Migrating birds have gone South, or are presently in the process, to wait out the winter. Many retired folks are heading for Florida and Southern California. But we can't pack up and move all our people and planes South, so we had better be prepared for the problems of winter.

■ During final approach, ice accumulated on the wings and left engine of a CT-39. The pilot increased speed to compensate for the aerodynamic effects, but the right wing stalled when the aircraft was about 10 feet above the runway. The wing tip struck the ground and was damaged.

Ice on the wings is just one of the annoyances of winter but an important one. No crew, of course, would take off with a load of ice. But it has happened. Frost or snow may be removed but there's no guarantee that the aircraft won't pick up more if fuel is loaded after the wings have been cleaned. The fuel may melt ice and snow but it also may cause condensation on the wing surface and subsequent freezing.

Blowing snow can create ice. Heat from aircraft ahead, or a differential in temperature from a lighted or protected ramp to a cold, windy runway may turn snow or water into ice. The aircraft may leave the ramp clean but engine blast from another aircraft may blow almost invisible particles of snow onto the surfaces of the aircraft behind it. The result may be flight control difficulties from ice formed by freezing of snow or water. Another problem is that snow or ic on wings may adversely affect thei aerodynamic properties, lengthenin takeoff, or even making it impossible for the aircraft to get of in the runway length available.

Slush picked up during taxiing can freeze and cause gear, flap or engine inlet icing. Another danger results from frequent applications o high thrust to "break away." The blast may throw ice and snow that

ı cause damage and injuries, so
ɛck six before you boost the
wer.

Taxi as if you have a load of
gs. Here's a scenario for one
ison why. You start to taxi, up
nes the power and you begin to
ve. It's kinda dark and snow and
sh make the taxi lines hard to
:. You overshot a turn and try to
rect. Even though you're moving
wly, the bird slides sideways. If
ı're not lucky, you may go off
pavement, hit a light standard, a
: cart, some AGE or another
plane. Just keep that possibility in
nd. Go very slow; if you can't see
lines you may have to stop and
a tow. Sloping taxiways are
ticularly dangerous when slick.

For a clean airplane, takeoff
rmally doesn't produce trouble;
wever, standing water, slush and
w can cause inlet icing problems
some aircraft. Heat may be
essary. Consult your dash one.

During cruise a major
isideration is clear air turbulence.
: jet stream has moved South and
quently is very intense. You
uld concentrate on conditions
ad, including destination
ather, whether you'll have to go
in alternate, icing conditions,
way condition, fuel state in case
ı have to hold.

One problem reported several
es last winter was holding or
cent early into icing conditions.
ng can be serious at temperatures
ween 0° and −8°C in
nuloform clouds and freezing
precipitation. Remember the rule: Heat before ice, not vice versa.

In winter expect more low visibility approaches. You may have to go around. Don't hesitate; it's far better to make a missed approach than to try to salvage a bad one. With low viz and snow covered landscape, illusions are possible. If it doesn't look right, it might not be right. Landings on snow covered overruns can result in some nasty surprises.

Landings can be a real adventure in conditions like these: Slick runway, snow covered overruns, berms placed beside the runway by snow plows, strong crosswind, low visibility approach. This is the time for your best instrument flying– on speed, on glideslope. A nice, firm touchdown– a grease job may start the bird hydroplaning. Remember the rubber and oil deposits on the far end will be slick, so get your speed down in the best part of the runway.

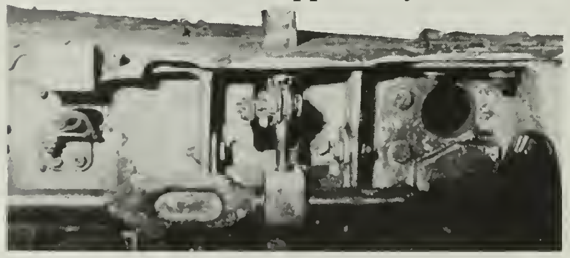
What this all adds up to is an alert crew that plans ahead and is prepared for contingencies such as blowing snow, WX below minimums, a possible missed approach. This crew has an A/C who knows his, the crew's and the aircraft's capabilities– and never exceeds them.

This article is certainly not all inclusive; its purpose is to get your attention. Remember how it was last winter. If you're a new guy on the winter block, learn from the old heads. They can save you a dented bird and maybe your life. ■

Little Things Mean A Lo

By LT COL EUGENE LA MOTHE
Directorate of Aerospace Safety

■ Little things mean a lot. If you don't believe it, read on and see what little things can do to an airplane. It took about ten seconds research to come up with a number of recent mishaps in which a minor oversight or failure of a small part played a major role. My purpose is not to highlight individual errors, but to show that these things do happen, and under the right circumstances could happen to you.



The pin that everyone missed. This cost us a destroyed aircraft when the wing folded on takeoff.

If the engine had run ten seconds longer, he probably would have made it. Fuel starvation due to a mis-positioned switch

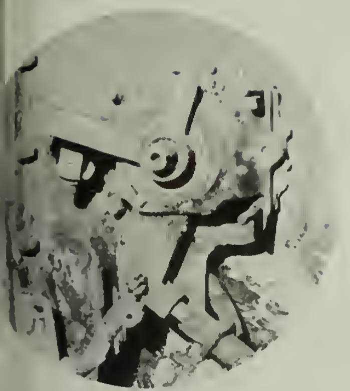
A flight of four fighters was taking off for a range mission. As nr 2 lifted off, the aircraft entered a climbing left bank. A successful ejection was initiated at approximately 700 feet, and the aircraft crashed on base. Everyone who helped prepare that aircraft for flight had missed one little thing—a pin sticking up on the left wing. The wing tip was not locked, and it folded as the aircraft rotated for takeoff.

The pilot of a fighter aircraft entered a precautionary landing pattern after experiencing a fuel system problem. This became a flameout landing pattern when the engine quit due to fuel starvation during the base turn. The pilot successfully ejected at 100 feet above the overrun and watched the fire trucks put out the fire. After air refueling, he failed to do on little thing—close the air refueling door. This trapped fuel in the external tanks a although the fuel totalizer showed 2,300 pounds, none this was available to the engine.

Have you ever seen an 8 million dollar pin? There is one out there somewhere because it was never install during assembly of a valve. The cross section shows hov the pin keeps the slide porti of the valve from turning. I our case, the one and only engine in a fighter belched coming off a bomb pass. The pilot shut it down and tried restart it. The engine could not start because the pin wa not there and the sleeve ha rotated. Just a little thing.

Little things break. Take example a feedback cable th tells the fuel control how

Transfer valve cutaways showing anti rotation pin in place and missing Missing pin allowed slide to turn in valve assembly and cost us an aircraf



Broken feedback cable due to bending loads imposed by frozen uniball in actuating layer. This resulted in engine failure and a destroyed aircraft.

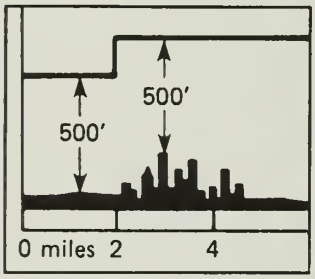
ıings are doing in the ıgine. This cable is attached ı the actuating lever by a mple ball bearing ·rangement (uniball) that ɔtates as the lever moves up ıd down. If this ball bearing eezes up, the cable flexes ıd breaks. The engine will ill run unless the pilot akes large throttle ‹cursions. He had no way of ıowing this as lead turned ıto him and he pulled up into "yo-yo" maneuver. His only ıgine quit, and he ıccessfully ejected at 800 et above the ground. Just a ttle ball bearing. . . .

Recently, a multi-motored ırcraft attempted to mate ith a blast fence, although ıe inadvisability of this citon is clearly evident. The ew started engines in ɛsponse to an alert klaxon. ll systems appeared to ɔerate normally, and the lot advanced power to taxi. s a right turn was ttempted, braking and eering capability were lost, ıd the aircraft continued raight ahead. The pilot shut ɔwn the engines and the ırcraft continued lumbering ɔward the blast fence which ɔsorbed the energy normally andled by the brakes. Come ı find out two little hydraulic ystem pressure switches ere leaning the wrong way. nly a little thing, but it had ıken a combination of errors ı turn them off.

What's the bottom line? There are a lot of little things that can bite you— too many to keep track of. That's why we have maintenance tech data and operational procedures. They provide our best defense. The professional approach required to maintain and operate USAF aircraft necessitates strict adherence to tech data and flight manual procedures. If you don't operate this way, you can be sure there are more little things around than you can step on. One of them is going to get you! ■

Wandering heavy vs blast fence after loss of nose wheel steering and brakes. A combination of errors resulted in two mis-positioned cockpit switches. Just a little thing. . . .

OPS topics



CORRECTION

■ The second paragraph of "MSAW—Pilot's Friend," September 1980, *Aerospace Safety* should be corrected to read:

"Those pilots who are not familiar with this program may ask, "How do I participate?" Very easily, indeed! Aircraft on an IFR flight plan that are equipped with an operating altitude encoding transponder automatically participate. That is, no specific request is necessary. Pilots on VFR or no flight plan may, provided they are equipped with an operating altitude encoding transponder, participate by asking the controller. Example: 'Los Angeles Center, (call sign) request MSAW.' However, it must be remembered, participating in the MSAW program does not relieve the pilot of the responsibility for safe altitude management."

How *Not* To Hunt

Have you ever heard of a hunting accident that wasn't as tragic as it was avoidable?

Hunter climbing fence, shotgun goes off and blows a hole in his head. . . . Didn't know rifle was loaded, pointed it at his buddy and BLAM! Safety wasn't on, hunter thought it was . . . a fatal mistake.

Judge for yourself what kind of mistake led to this tragedy. Four of our finest were on a hunting trip. They had rented a houseboat and, because they couldn't get the engine started, were floating downstream. Suddenly a moose appeared, and they started blasting away, but they didn't get him. He then turned back and started swimming down the river. Two of the foursome laid down on the bow, one tended the boat, and the other hunter began firing over the two lying down. Sure enough, one raised his head just as the man behind fired and was hit in the back of the head. By the time they got him to the hospital, he was DOA.

Stick Grip

An A-10 pilot had his hands full (literally) when the stick grip came off. The aircraft was in a steep, turning dive, fortunately at 10,000 AGL. The pilot dropped the grip, grabbed the stick and recovered to level flight. Subsequently, he got the grip reconnected to the stick and made a safe landing at home plate.

BLACKBIRD REUNION

A Blackbird reunion for all associated with SR-71 and U-2 programs, is slated for 15, 16, and 17 May 1981. For Blackbird reunion/banquet reservation information write:
Blackbird Reunion
c/o 9 SRW/CCE
Beale AFB, California
95903
(916) 634-2692

SAC Studies Possibl[e] Trainer

Strategic Air Comma[nd] is currently studying t[he] possibility of using a Co[m]panion Trainer Aircraft [f]or B-52 training which cou[ld] reduce operating costs a[nd] still maintain B-52 aircr[ew] flying proficiency.

CTA is basically a lo[w] cost off-the-shelf busine[ss] jet minimally modifi[ed] with avionics equipment [to] include radar, electron[ic] countermeasures equi[p]ment and navigation equi[p]ment.

If procured, the aircra[ft] would be used to augme[nt] B-52 aircrew training at [a] fraction of the cost ass[o]ciated with the B-52.

SAC estimates a 25 pe[r]cent reduction in B-52 fl[y]ing time, supplemente[d] with a CTA, would resu[lt] in an annual savings [of] more than $100 millio[n] for fuel alone.

The program calls fo[r] tests to begin in Augu[st] 1981 with full scale de[velopment] of the CTA sys[tem] to begin in Octobe[r] 1982.

ang Glider

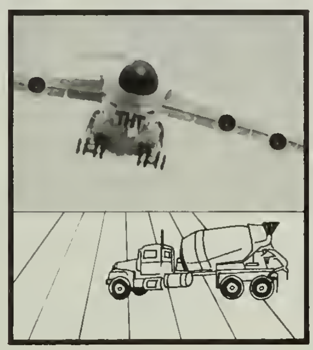
As if other aircraft and ırds were not enough, we ow have to watch out for ang gliders. Seems one f our pilots saw that speck n the windshield turn into hang glider. The miss distance was estimated at 300 feet. Naturally, they will be on our low level training routes. So be especially vigilant in that arena. Even the wake of one of our birds could be fatal to a hang glider.

81 Woes

The aircrew arrived at ne aircraft at "O-dark ıirty" for an airlift mision. A look at the magic naintenance book (781) howed a relatively non-:ary write-up detailing a -mile error in the copilot's ME. The rub, however, vas that a check of the ockpit showed a gaping ole in the dashboard where ne copilot's RMI (with ME) used to be. A reheck of the forms showed ne aircraft on a red digonal (signed off) and *o mention anywhere of ny piece of equipment eing removed.* Several of ne folks threw up their ands and said "well, it's aircraft commanders discretion if you take it or not." They were certainly right, but the thrust of this incident is twofold: First– yes, it is always the aircraft commander's discretion to take or not take a machine, regardless of what the forms say. Second– that 781 is the history and current status of your machine. It is a two-way communication vehicle– make sure it reflects what really happens and also be conscientious about the write-ups you add. ALL TOWARD THE SAME END . . . SAFE MISSION ACCOMPLISHMENT!

Cleared to Land?

A contractor was working concrete on a taxiway adjacent to the main runway. One of those world-famous "new guys" was moving some equipment and decided since the infield was muddy, he would just "go around the other way." He entered the active runway, drove approximately 3,000 feet and exited on the next taxiway. No metal belt or clothes torn! Fortunately, there were no injuries, but maybe only because the copilot of the multi-motor didn't completely trust the "cleared to land" and told his boss to go around. Trust everybody, but that extra look down the runway may save a catastrophe!



Cockpit FOD

At 600 KCAS an F-4D began a slow roll to the left and the pilot had to use full right roll trim and 30 lbs or so of right stick force to level the wings. A controllability check indicated the aircraft could be landed, which the pilot proceeded to do. A two-inch tear in the aft cockpit stick well boot and a felt tip marker in the stick well apparently was the cause of the unwanted left roll.

Sleeves Down

It just wasn't an A-7 pilot's day. On rollout following a formation landing the FLIP Supplement, which had been placed on the right glareshield, fell down to the right console. The pilot in attempting to get it snagged his sleeve on the telescoping canopy locking handle. The handle was exposed because the plastic guard was broken and the handle was in the extended position. The canopy opened and wind carried it back along the top of the fuselage to the vertical stabilizer where it embedded and stayed. Another reason for keeping one's sleeves rolled down. ■

Food For Thought

By SQN LDR JOHN C. GRIFFITHS, RAAF
Directorate of Aerospace Safety

■ Are you one of the estimated three out of four people who skipped breakfast this morning? If you did, you could be a candidate for an accident according to Dr. J.E. Monagle of the Department of National Health and Welfare, Canada.

He points out that your blood sugar after an overnight fast may be at a reduced level when you wake up. This condition, known as hypoglycemia, may cause morning headache, irritability, irrational emotional responses, grogginess, and confusion.

Add to these the effect of sudden stress or emotional reaction, such as a last minute glitch in our trusty crew transport. This stimulates a sudden release of adrenalin, which raises blood sugar, and causes other disturbing symptoms such as fear, anxiety, headache, shakiness, weakness, dizziness, shortness of breath and palpitations of the heart. The preoccupation and distraction from these symptoms may increase your chances of an accident. The anxiety may cause hyperventilation, producing additional disconcerting symptoms such as numbness, tingling, warmth and dizziness, with

r without respiratory symptoms.)r. Monagle cautions that when ou're in this state, it's unwise to do hings requiring alertness, oncentration, mental and physical esponses.

Studies at a university add to hese facts. Students who didn't ave breakfast showed markedly oorer classroom performance. In ondon, police have noted that raffic accidents happening around 0 or 11 a.m. frequently involve ersons who have not eaten, or at east not properly. Certain people, specially those with emotional roblems, will develop ypoglycemic symptoms 2 to 3 ours after ingesting a meal rich in arbohydrates.

While we have no definitive tatistics on accidents to non-reakfasted pilots, the points made ere apply also to pilots. To be entally and physically alert, the reakfast should contain some rotein– an egg, glass of milk, or ven a sausage or some bacon *efore* flight planning.

Many individuals routinely skip reakfast. However, aircrews should ot deviate from their usual dietary abits when flying– that includes unch. Lunch at the candy machine while checking weather and OTAMs on a stopover flight plan) rapidly overshadowing the Fighter ilot's Breakfast on the list of ircrew favorites. By the time upper comes around we could eat a orse– washed down with some "Colorado Cool Aide," of course. hat's one hell of a way to treat the most sophisticated piece of data management in your airplane.

A typical scenario for the hypoglycemia incident would to something like this. Remember, the most likely person to experience this would be someone subjected to severe psychological stress in the form of anxiety. (A student pilot in an advanced jet trainer appears to rate highest in this act).

0430	Awoke and ate toast and coffee
0505	Arrived at squadron
0515-0540	Preflight planning
0545-0630	IP briefing
0630-0710	Aircraft preflight
0710	Taxi takeoff

This was the student's first flight in advanced instruments, and it had been one month since he had last flown instruments. Ten minutes into the instrument portion of the mission, he began to come unglued. He began to over-correct, and when the IP noticed that the aircraft was climbing after a rollout from a turn, he queried the student who reported symptoms of dizziness, tingling and generalized warmth. The IP then declared an emergency (altitude 29,000, cabin altitude 12,000 feet) and began a descent. The student made a PRICE check and went to 100 percent oxygen—no malfuncitons were detected.

Dizziness gradually cleared during the descent and the student reported he was "completely normal at the time of landing." The student never reported heavy breathing and the IP did not recall the student pilot breathing heavily, but because the symptoms are compatible with hyperventilation, that was considered to be the most likely possibility.

But, is it the only factor to be considered? Could the hyperventilation symptoms have been produced by the anxiety of adrenalin released in response to lowered blood sugar? Let's put the pieces together in a logical manner. The student had become accustomed, through the years, to a diet of heavy meals at regular intervals. But, after the customary evening meal the night before, breakfast on the day in question consisted only of toast and coffee, and that at a much earlier hour than normal. As in any normal individual, the amount of sugar in his blood is controlled by the type of food consumed and by two body chemicals, insulin, which lowers the blood sugar level, and adrenalin, which raises it by "squeezing" sugar from the liver and muscles (where it is stored as glycogen). However, if prolonged fasting has reduced the usual body stores of glycogen, the elevation of blood sugar may be minimal, whereas the unpleasant effects of adrenalin may be maximal. Normally, the amount of sugar in the blood rises rapidly after eating; this triggers the secretion of insulin by the pancreas and within two or three hours the level is back to normal limits. The level of sugar in the blood is a critical factor in the functioning of brain cells, since they use sugar almost exclusively as their source of energy. ☞

Food For Thought

continued

In this particular case, the student "fasted" from 1900 the night before until the time of his reaction (about 0730). This is a fast of more than 12 hours, broken only by coffee and toast. It is entirely possible that the toast and coffee triggered the insulin mechanism and brought his blood sugar down to a borderline level. At this point, three hours after eating, he was subjected to severe psychological stress in the form of anxiety. Under these conditions, adrenalin (or epinephrine) is released into the bloodstream. Adrenalin can cause the symptoms of dizziness, weakness, sweating, and produce the anxiety which leads to hyperventilation, as in this student.

When the IP takes over, declares an emergency and begins a descent, the student's emergency is over; he can relax, so the level of adrenalin rapidly diminishes. His symptoms disappear by the time the IP lands the aircraft.

A blood test taken post-flight revealed that his blood sugar level was still in a "borderline" status. The real culprit here is hypoglycemia and every crewmember must realize his own vulnerability under similar conditions. You may get away with lapses and omissions occasionally, but as long as the laws of probability are valid, you can expect to have a reaction at some unspecified time and under conditions which may be more dangerous than this student's. Try speculating on what might have been the outcome had he been solo.

Let's run this by again and see what our student should have consumed prior to his mission. (The January 1978 *Aerospace Safety* gave an excellent appraisal of proper nutrition under the title "The Fighter Pilot's Breakfast.") We do not need a gourmet's delight in every meal we eat; what we do need is a balanced diet. All the food groups should be represented including:

1. Breads, enriched or whole grain; cereal or potatoes.
2. Citrus fruits, other fruits and vegetables.
3. Dark green or deep yellow vegetables.
4. Fats: Butter, margarine and other fat spreads.
5. Meat: Fish, poultry; cheese or eggs.
6. Milk.

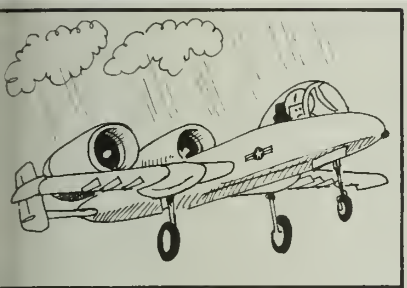
That's right, we all need some fats in our diet, and, would you believe, carbohydrates as well. I'm not proposing that we live on Big Macs and fries; what I do suggest, though, is have a good look at the meals you are now eating and see if you are doing your body justice. Try to spread the daily intake into three balanced meals.

Remember also that crash diets have no place in the life of the aircrew member. If you are finding it difficult to make those weigh-ins, check with the Flight Surgeon first; he will advise you what your ideal body weight should be and how best to maintain it. Crash dieting may result in some immediate weight loss, but you don't get the nutrition required for proper health. As well as loss in the fatty tissue, you will lose needed protein and muscle tissue. What's more, the body will quickly regain those lost pounds when the crash diet is terminated– quite often the dieter ends up heavier than when he started. Som diets are dangerous. For example, the liquid protein fad has been associated with a number of sudde deaths attributed to severe chemica imbalances.

Back to our student, there is no requirement for a fancy breakfast o pancakes and all the trimmings– a glass of orange juice, milk and cereal, perhaps with toast and butt or jelly will provide many of the food groups he needs. As aircrew members, it behooves us to realize that we have some control over those early morning butterflies. As supervisors and IPs we should be cognizant of the stressful environment the trainee pilot is forced into– part of our superviso role obviously involves the man of the man/machine system. Let's ensure that the man has the opportunity to take in those well-earned vitamins. That includes tim out for an adequate lunch (at least sandwich) instead of a trip to the candy machine.

Footnote: For those fortunate enough to be a crewmember of multiplace aircraft, don't forget some commands lay down addition guidelines on *when* we can eat thos inflight delights. ■

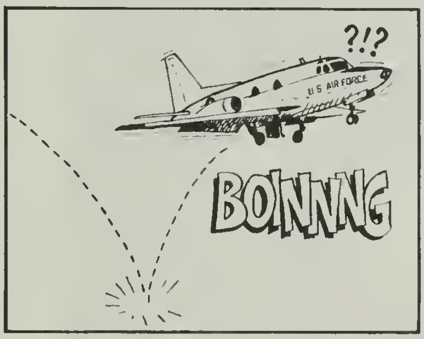
THERE I WAS



he response to "There I Was . . ." equests has been great. Letters reating lessons learned from personal agas of narrow escape continue to rrive each week. The following acount relates how a pilot can fall into trap by relying on "old habit paterns" and not on checklist proedures. A similar circumstance may pply to many of us, so "listen up" o There I Was . . .

■ An A-10 IP chasing another pilot uring landing patterns. He was fast n downwind and I was lagging beind a bit. At 200 kts, he extended 0 percent speedbrakes, his gear and hen flaps rather quickly. I did also nd was rather busy staying with him. checked his configuration turning ase, checked my own gear all O.K. On short final at 120 kts, I started eeling very uncomfortable, like a igh sink rate was commencing and nose high attitude. Then it hit me. My flaps had not extended due to high irspeed which automatically reacts them above about 185-200 kts. Quickly, I lowered them, and all was vell. The speed range of the automatic retract feature allowed my student's flaps to extend but not mine. My habit pattern from previous aircraft did not include a check of the flap gage (there was none). Without flaps my power was at idle and a few more seconds would have resulted in a high sink rate. Before the fan lag was over and go-around thrust available, I would have hit the ground off the side of the runway. Dumb!

Thanks to the A-10 pilot for relating his experience. We hope it will help you Wart Hog drivers.



Having spent three fun weeks of TDY and flying only when required, I was ready to go home and say hi to momma.

We finally got the word to go via three intermediate stops. My crew reported at O-Dark-Thirty, rested and ready to go. Then we got the classic, STANDBY. After several hours I was told to go into crew rest. At about 1800 that evening I received a call to take off at 2200. The flight to the intermediate stops was uneventful. On the approach to the home patch, I felt tired but okay. The approach and flare seemed okay until 50 feet when the aircraft just dropped out of the sky. On the way back up, full power was added and a fabulous recovery was made. It had to be fabulous, the top of the bounce was about 75 feet and NO airspeed. I almost did not walk away.

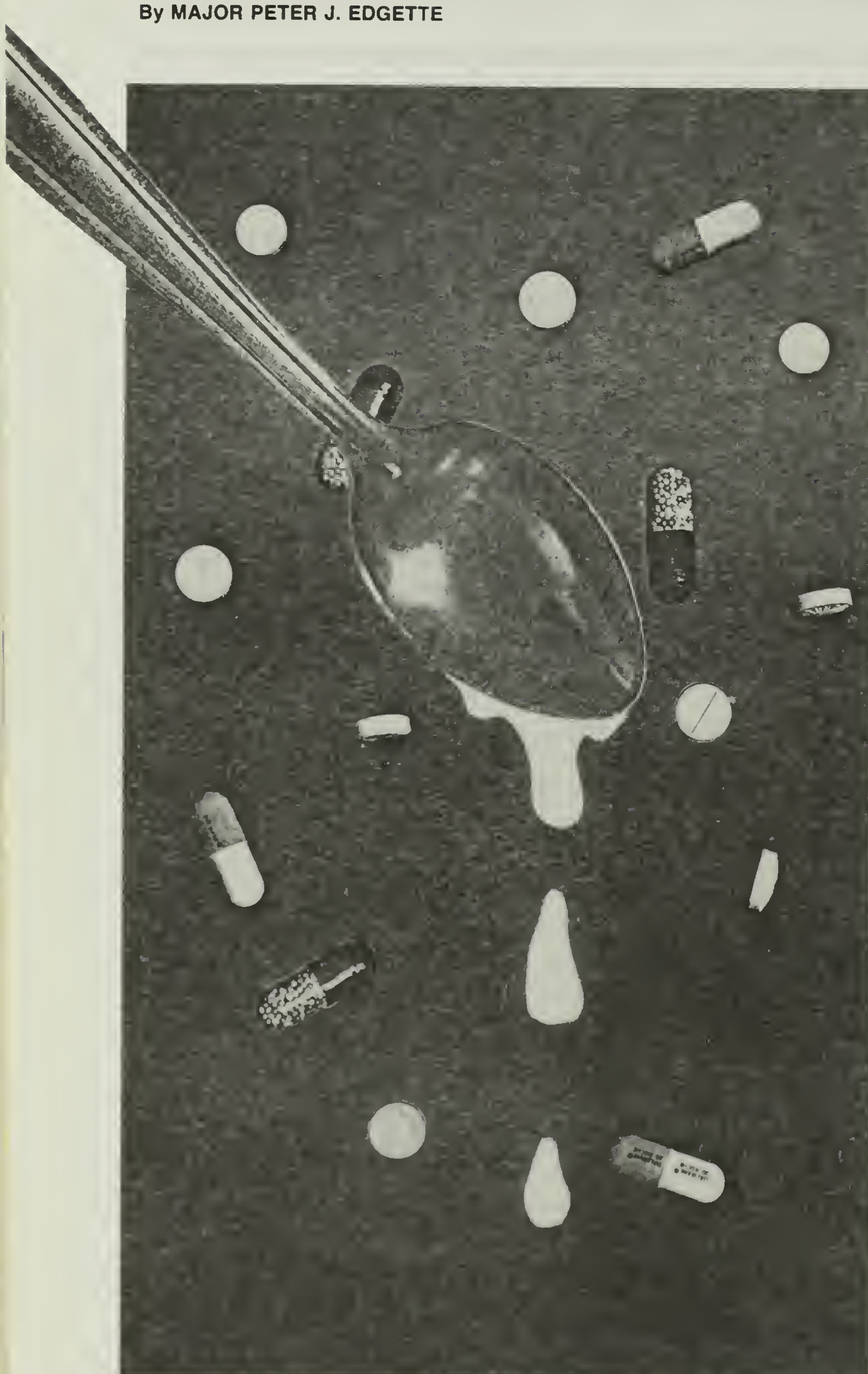
After getting out of the aircraft, I noticed a big sinking sensation similar to that in the aircraft. I could barely stay awake. Then I realized I had been awake 36 hours and had just logged 12 hours flying time. I now take crew rest more seriously. I will NOT endanger myself and more importantly, my passengers, to factors amounting to excessive fatigue.

In my opinion this aircraft commander has learned a good lesson the hard way, the way many of us have. In the final analysis, he has the sole responsibility to insure he is ready to fly, but others can learn from this incident. Commanders, Operations Officers and Schedulers should take careful note of this young man's problem. He didn't build that box all by himself, he had help. Try going back to sleep for crew rest after you've just had a good night's sleep sometime. Thanks. ■

Brig Gen Leland K. Lukens
Director of Aerospace Safety

Self Medication Do a

By MAJOR PETER J. EDGETTE



■ By way of introduction I would like to mention some articles I wro in the June and July 1978 issues of the *Army Aviation Digest* (''Altitud Physiology Training– Yes or No'' in the June issue and ''Stresses Encountered Before Flight'' in the July issue). When I wrote those articles, I was assigned to the U.S. Army Aeromedical Center, Aeromedical Activity, Fort Rucker, as an instructor. I viewed the publishing of articles in the *Aviatio Digest* as an extension of my teaching/instructing. I was responsible for teaching the entire aeromedical block of instruction– altitude physiology, night vision, stress and fatigue, and one particula segment of instruction entitled ''Aviation Medicine.'' The classes were and presently are taught to initial entry students and a combination of these classes is taught in the transition courses at Fort Rucker.

Back to the particular subject of instruction mentioned above– aviation medicine. I am sure all of you who have attended the Initial Entry Course especially remember not the instructor as much as the cute slides depicting a flight surgeor wearing a modified Mickey Mouse hat with a rotor attached. Captions such as ''The flight surgeon is your friend'' and ''Don't self-medicate'' were tossed about the classroom and openly discussed by whomever. I can remember, clear as day, getting wrapped around the axle in discussing what medication we as aviators can take without a prescription. The discussion even

ach...NOT as I did!

ent so far as aspirin and the letter f the law. Could we as aviators .lf-medicate with aspirin?

I must have taught that class more an 300 times. I distinctly member bringing to class one type f training aid, a copy of *U.S. News nd World Report* which had an ticle titled "Over-the-Counter rescriptions." The article stressed e idea that the various daytime lmatives calm you by making you owsy in your seat, and that the st thing a heavy equipment perator or an airline pilot needs is be drowsy in his seat. Enough of e introduction.

The title of the article you are ading/scanning/burning/using in y of a number of ways is "Do As Teach, Not As I Did." The sad int of this particular title is, pefully, a vivid picture of what uld happen with self-medication.

My current assignment is that of a ustoff unit commander. In that pacity I spend most of my time on e ground but occasionally manage me field grade flying.

About three months ago, I was ting in my office, talking to one the pilots, when I developed a nus headache. I imagine I am rmal when it comes to sinus vities. I have them just like eryone else, but my sinus adaches must be the worst torture the world. I don't want to talk, I n't want to be in bright light, I n't even want to walk. All I want to lie down and go to bed. With is in mind, you can imagine how I arted to feel knowing a sinus adache was approaching. I don't want you to get the idea that I have all kinds of time to prepare for a sinus headache. I pass through stages of discomfort just like anyone else. On with the story!

I have known for years that self-medication is taboo. I realize I should not take medication prescribed for a prior illness nor medication prescribed for another member of my family, but remember, I had this awful sinus headache. I remembered a small bottle of Novahistine DM in my desk. I honestly can't remember where I picked it up but the expiration date was June 81 and it was an antihistamine. I wasn't scheduled to fly that day, but unfortunately, I didn't even consider that crucial factor.

After opening the bottle I took a small swig, about one teaspoonful. For one reason or another I looked at the clock. It was 1500. I continued with some paperwork, not even giving my self-medication a second thought, when all of a sudden I began to sweat profusely. I noticed the time. It was 1515. My pulse rate became very rapid and my vision blurred. I felt hot all over and tried to get up from my seat. My admin officer looked over at me and said, "You look like a ghost. What's wrong?" I muttered something and could not even stand up. I thought that I must be having a heart attack. I had never felt that way before.

After sitting there for a few minutes I remembered the self-medication. All of the classes I had taught concerning aviation medicine flashed through my head. Why did I take that medicine?

I finally managed to get downstairs and across the parking lot to the flight surgeon. I must have still looked terrible because the medic came around the counter and had me sit down. I told the flight surgeon what had happened and showed him the partially consumed bottle. He immediately grounded me and told me exactly what I had taken. Novahistine DH contains codeine and a warning about possible drowsiness for people who operate heavy machinery. I had a severe reaction to the drug.

What if I had been scheduled to fly that day? I realize that with the sinus problem I could not have flown, just as I realize I should not self-medicate. But, what if I had completed my preflight at 1500 that day and at 1515 had been IFR at 6,000 feet?

I was fortunate that afternoon in that I was not scheduled to fly and that I did not suffer any permanent damage. I cannot stress, teach, instruct enough concerning self-medication. Please, don't self-medicate. The responsibility rests with you. ■

About The Author

Major Edgette is a Medical Service Corps officer. He has his Masters in Hospital Administration from Baylor University and a Masters in Public Administration from the University of Northern Colorado. He is currently commander of the 57th Medical Detachment, Fort Bragg.

FOR EAGLE DRIVERS ONLY
But Other Types Should Read It, Too

By CAPT PAUL Q. G. WOODFORD
32 TFS/DOO

"Back to the basics." How many times have you read, heard or said those words. We all recognize the concept but often the words are only lip service. The author goes beyond that in this article we lifted from USAFE's *Airscoop*, August 1980.

■ **Some Thoughts to Live By**

You're entering the area at 5,000 feet above a solid cloud layer. Haven't called ready to play, but suddenly the controller is giving you urgent bullseye calls on two bogeys who sound pretty close. No contact. You lower the el and just like magic you get two hits, 20 right, 15 and 16 miles. Sampling the close target, you see a beam aspect, crossing right to left, level at 200 feet. That's low for certain, so you start a shallow descent as you break lock and sample the second bogey. Same aspect, right on the water. You're entering the cloud layer as you take a final lock on the close man, now just inside 10 miles. Cut to the left, push it up, and check your pitch attitude again— can't let your nose get buried when you're low and in the weather, and— just ain't your day, Buckwheat, the radar breaks lock. Beak! Okay, keep searching, you know where they were. Double beak! Just how long does a doppler update last anyway? All right then, you pinkos, auto guns. No contact. Slew it down. Still no contact.

YGBSM!

And you're just thinking about regrouping when you flush out of the bottom of the clouds at 300 feet, going like stink with the VVI pegged and the nose 12 degrees lo You don't even have time to say "Oh, sh. . . ."

Before you toss a nickle on the grass and say "It can't happen to me," consider a couple of things: should be blindingly obvious to anyone brighter than a broomstick that pilots in the tactical communit are busting their butts at a great rate. It's also clear that some of th recent fatal accidents are at least partly attributable to breakdowns i aircraft control while pilots are "peaking and tweaking" their systems during IMC flight at low altitude. Some of these breakdown may result from poor instrument flying skills, but most appear to result from diverted or misdirected attention.

I don't believe our problems stem om a lack of instrument flying (perience. We in USAFE probably ve more instrument experience an anyone this side of the urricane Hunters. The problem, I ink, is that we don't respect the solutely critical importance of aintaining our basic instrument ills. A lot of us think that basic strument skills are second-nature, ce riding a bike. Sadly, that's not ie. I'm not saying that any of us n't flail through a TACAN pproach once a year for Stan/Eval; n saying that really excellent ying requires plenty of practice and tention to basic instrument skills. irther, the combination of mission quirements and European weather at we live with demands excellent ying, all the time.

There are several areas where this mbination of mission and IMC its us on the spot: High to low nversions, as in our opening ample; trail departures; night ying on the wing; even flying the se defense CAP in minimum ceptable VFR. You can surely ink of more examples. The point is at we have to fly and fight (and n't you ever forget it), and we d doggone well better be able to ck the weather. To do this, we ed three things: An effective cross eck, a well-trimmed airplane, and sense of priorities.

A cross check, according to AFM -37, ". . . is a proper division of ention and the interpretation of flight instruments." Everything out the F-15's cockpit layout is signed to facilitate this essential k. The eye-level HUD repeats the formation displayed by the central ıster of primary flight instruments, d these are backed up by the ndby instruments. Everything the ot needs to know to fly his jet is ht in front, with only minimal rtical and horizontal scanning quired. Our radar and weapons controls are optimized for "heads out" flying; they are therefore optimized for instrument flight as well. To be effective, however, a cross check has to be appropriate to the aircraft. How many of us are still using cross check techniques from other times and other planes? To become second-nature, a cross check has to be practiced over and over. How many of us consciously force ourselves to cross check as we work our weapon systems in VMC? It's a skill we have to have mastered before we enter IMC.

Once your cross check is cooking, you trim. Having the best cross check in USAFE is only of marginal use if you're fighting the controls; you should never settle for less than a "hands off" aircraft. A trimmed aircraft will hold a constant attitude, freeing you for other tasks; more importantly, it will help keep you from subconsciously overcorrecting an out of trim condition in IMC or at night when you're busy. Watch out, however, for the lag in the Eagle's automatic trim system: If you're hasty about trimming off pressures after attitude or speed changes, you'll end up fighting a system that's trying to work for you. Don't neglect the rudder trim either— apart from helping you avoid slow and insidious rolling inputs, a centered ball will get you more holes in the DART.

A good cross check and a trimmed jet aren't nearly enough, however. You have to prioritize. Cockpit task prioritization is an extension of the instrument cross check; it is made up of two parts systems knowledge, three parts tactical savvy, and ten parts self-preservation. When can you peak and tweak, when should you let the auto modes do most of the work, and when should you forget the radar and fly the airplane? Every situation demands a different answer: During low altitude intercept work, for example, you might crank the frame store up more than normal and set the radar the way you want it before you enter the weather. Sometimes it may be appropriate to get on top of the weather and do your sorting where you can devote more attention to it. One thing's certain, though— a healthy fear of death ought to drive your sense of priorities. There is no operational requirement to lock up lead immediately after liftoff on a trail departure, and there's no reason on God's green earth to be doing anything but flying the gages after falling off the wing at night.

These skills—cross checking, trimming, and prioritizing—are as critical as having a blank check in your wallet and as basic as beer. When you're scrambled against a low-flying unknown in the BZ at three o'clock on a cruddy morning, you've got to have it together. Take every chance on every training sortie you fly to develop your basic skills. Don't let an opportunity to fly a TACAN approach go by, and consistent with ROE and flying safety, don't pass up a chance for low altitude work in marginal weather. When you've got to fly a trail departure, do it no-lock and learn from it. If you're a flight lead, try to brief and work some of these opportunities for basic skill practice into your flights. Times are tough, and if you're planning to wait until we get enough flying time to log collateral sorties for instrument practice, you'll probably be interested in some investment property I have in Arizona. . . .

We can never afford to be casual about the basics, and we can't ever assume they're second-nature in our wingmen or ourselves. Our mission and flying environment preclude this kind of thinking. We're here to fly and fight— and live to do it again. So practice, think, and practice some more. And instead of saying "It can't happen to me," say "I *won't* let it happen to me." ■

the RUMOR MILL

By MAJOR ARTHUR P. MEIKEL
Directorate of Aerospace Safety

"PICK ME UP AT THE HAMMERHEAD"*

■ Remember the good old days back in 1979 when "pick me up at the hammerhead" meant that some lucky guy/gal wasn't going to be forced to sit through the air refueling and nav leg. He or she was going to get picked up at the end of the runway to get his or her semiquarterly landing. Often it meant a chance for you to show your new haircut to an important staff IP. "Nice landing, Sir!", said the IP, bristling with integrity, while the copilot tightened the seat belt in jump seat. Ah . . . the memories.

Recently our title phrase has taken on a new meaning. There is absolutely no truth to the rumor that SAC or TAC or the Air Force at large is planning a program to bus the entire aircrew to the hammerhead; thus avoiding the recent most perilous danger to large aircraft, the ramp. It would save fuel, but the hammerheads are generally too small for large operations anyway.

As I see it from my small corner of the world, which is the corner which deals with big airplanes, the rumor probably stems from the 1980 parade of Class A ground mishaps involving large aircraft.

In early January, a $6,731,000 EC-135 aircraft was destroyed by fire on a TAC base while heating water. The fire developed from shorted electrical components, coul not be extinguished, and the aircraf was destroyed.

A little over a month later, a KC-135Q was destroyed by fire during a ground refueling operation The fuel panel operator suffered second degree burns when an explosion occurred in the aft body fuel tank area. Damage from the explosion and ensuing fire totaled $3,900,000.

In July, a water truck jumped the

*The Hammerhead is also known as the runup pad, apron, or the wide part of the taxiway near the runway

80 has proven the ramp to be a dan-
rous area for large aircraft. At left—a
135 is lost as it is consumed by fire.
ght—Fuel truck struck parked aircraft
er jumping its chocks.

ocks while servicing a KC-135. e truck hit the aircraft causing nost $400,000 damage to the ck and aircraft.

In August, a B-52 was completely stroyed by an explosion and bsequent fire while transferring ernal fuel between aircraft fuel ks.

Even though another KC-135 shap in July was classified as a ght mishap in accordance with the R 127-4 definition, it occurred ring taxi on an alert exercise in parking area. In this mishap the craft responded to "the horn" for axi exercise. As the aircraft led out of the chocks it did not pond to steering or brake inputs. continued forward striking a blast ce causing extensive damage 90,000).

The five above mentioned shaps represent three airframes t will remain only as memories in Form 5 shop. The other two will lost for some time. All mishaps re costly and resulted in the loss USAF resources. In contrast to ground mishaps (with the exception of the alert taxi mishap), both the C-135 and B-52 have an excellent 1980 Class A flight mishap rate at this point.

Complacency is a fear that comes to mind when things are going well. The example of the July KC-135 alert taxi mishap should scare the complacency out of anyone. One moment you are pulling out of the chocks and 30 seconds later you have hit a blast fence damaging three of your engines. Respect for the machine is one way of deterring complacency. Another good way to avoid complacency is to be active in some aspect of a safety program. In light of recent ground mishaps, perhaps the crewmember should become more involved in ground operations. For example, fill out an AF Form 847, talk to the maintenance troops, make your next SOF tour more safety oriented, encourage someone to fill out a good AFTO Form 22 or complete an HR on any unsafe ground related problem.

The ground mishaps also point out that disaster can be a moment away. If you look at some of the factors involved in our five ramp disasters they could include:

Lack of discipline.
Lack of knowledge.
Faulty T.O. instructions.
Faulty equipment designs.
Poor supervision.
Poor procedures.

These are general causes that you've all heard before in relation to flight mishaps. Flight safety has been a part of your life for a long enough period for some of its principles to rub off on you. Apply some of your flight safety knowledge to the aircraft ground environment. Give the maintenance troops a boost.

The rumor previously mentioned is obviously the product of a fertile mind. What the captain means is: "Help, stop that trend!" In short, give the guys on the ground the benefit of your experience. An aircraft that is lost is gone forever whether it is on the ground or in the air. ■

posite: Early fire detection this year has prevented major damage to
east two aircraft; however, no one was on board this aircraft when
broke out. Below: Once established fires can be hard to extinguish.
ses may be required to sustain a two or three hour firefighting effort.

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

RATED DEPARTMENTAL/ Joint Assignments

By **MAJOR RON KARP**
Rated Officer Career Management Branch

■ If you are a rated officer seeking a responsible position in a high-level policy drafting and decision making activity, AFMPC's Rated Departmental/Joint Career Management Section (the old "SPECAT" shop) may have just the challenging job you're looking for. The term "Departmental/Joint" refers to those positions assigned to the Air Staff (Departmental) or to DOD, combined, and allied staffs worldwide (Joint). The significant responsibilities and impacts these activities have on the AF mission means that specialized manning considerations are given to each position.

Departmental/Joint positions typically become vacant due to an incumbent officer's completion of a tour, promotion to colonel, assignment to in-residence PME, or reassignment to higher levels– so positions are always becoming available. Manning requests are initiated by prospective using agencies through formal requisitions which outline their specific requirements for each job– such as grade, weapon system background, academic degree, special experience, etc. Most positions require field grade officers, although some flying jobs call for lesser grade. The key to competing for these high visibility positions is overall sustained superior duty performance. Other considerations in the selection process are gate credit, weapon system currency and viability, and Professional Military Education. Strong writing and briefing skills are also universally requested by all using agencies. In short, the officers most in demand are those who are top performers with strong operational *and* staff credentials. We've outlined below the major Departmental/ Joint agencies and what type of general background they require. Further details with a complete requirement listing can be found in AFP 36-6, The Assignment In[formation] Directory (AID). A copy of the AID shoul[d be] at your flying squadron and your local CBPO. If [you] can't find a copy, call us– the AID can be the ke[y to] your next assignment!

Air Staff

Working in the executive part of the Department of [the] Air Force is undoubtedly one of the most challeng[ing,] fast-paced jobs available in the USAF today. Air S[taff] agencies normally desire previous staff experience s[ince] most jobs entail action officer duties at the program m[an]agement level. Many positions require extensive acade[mic] backgrounds in science, engineering, or math. A grow[ing] need for officers with advanced degrees in syst[ems] analysis and operations research also exists. The A[ir] Strategic and Tactical Sciences Program was specific[ally] designed to meet this demand, and recent graduates [are] some of the most sought-after officers. Air Staff posit[ions] are tailor-made for the officer seeking to participat[e in] Air Force management from a "big picture" perspect[ive.]

Air Staff Agencies

Office of Sec of AF (SAF)
Office of Chief of Staff (CC)
Office of Vice Chief of Staff (CV)
Deputy Chief of Staff, Manpower & Personnel (MP)
Deputy Chief of Staff, Research, Development & Acquisition (RD)
Assistant Chief of Staff, Intelligence (IN)
Deputy Chief of Staff, Programs and Evaluation (PA
Deputy Chief of Staff, Logistics and Engineering (L
Assistant Chief of Staff, Studies and Analysis (SA)
Deputy Chief of Staff, Operations, Plans, and Readiness (XO)
Legislative Liaison (LL)
Office of AF Reserve (RE)
National Guard Bureau (NGB)
Inspector General of the AF (IG)

oint Staff

onus Joint Staff

Officers in these positions work at the very highest vels within the United States military establishment. ceptionally outstanding officers with strong staff and erational backgrounds are required for these high visi-ity positions. Along with their inter-service counter-rts, USAF officers assigned to the Joint Staff are eply involved in defining the roles and missions of Air Force and its future contributions to our nation's e in the international political-military arena.

ONUS Joint Staff Agencies

)ffice of Sec Defense (OSD)
)ffice of Joint Chiefs of Staff (OJCS)
)efense Intelligence Agency (DIA)
)efense Logistics Agency (DLA)
)efense Communications Agency (DCA)
)efense Mapping Agency (DMA)
'ederal Aviation Agency (FAA)
lational Aeronautics and Space Admin (NASA)
eadiness Command (REDCOM)
tlantic Command (LANTCOM)
oint Strategic Target Planning Staff (JSTPS)
oint Task Force, Electronic Warfare and Close Air Support (EWCAS)

erseas Joint/Allied Staff

USAF officers are assigned to various Joint/Allied ff billets worldwide. Available positions vary from h level staff (SHAPE, NATO, EUCOM, etc.) to the iquely challenged UN peace observers stationed in the ddle East. Most jobs require previous staff experience. iile all types of operational backgrounds are required, USAF mission and the needs of the combined staff these areas rely heavily on fighter expertise. Most of assignemnts are accompanied tours; however, some our most interesting billets will give you remote tour dit (Korea, Turkey, Iceland, Israel, and Johnson Atoll).

Overseas Joint/Allied Staff Agencies

European Command (EUCOM) - Germany
Supreme HQ Allied Powers Europe (SHAPE) - Belgium
Allied Forces North (AFNORTH) - Norway
Allied Forces South (AFSOUTH) - Italy
Allied Forces Central Europe (AFCENT) - Netherlands
Allied Air Forces Central Europe (AAFCE) - Germany
2d Allied Tactical Air Forces (2ATAF) - Germany
4th Allied Tactical Air Forces (4ATAF) - Germany
5th Allied Tactical Air Forces (5ATAF) - Italy
6th Allied Tactical Air Forces (6ATAF) - Turkey
Pacific Command (PACOM) - Hawaii
US Forces Korea
Combined Forces Command (CFC) - Korea
Southern Command (SOUTHCOM) - Panama
US Forces Japan
UN Peace Observers

Overseas USAF Military Assistance

Military advisor positions in Missions, Military Groups, MAAGs, and other organizations deal with foreign military sales and assistance. Many of these jobs include flying duties (usually in the locally assigned fighter aircraft or the C-12). Thirty countries currently have rated USAF Military Assistance personnel assigned. Most are relatively small operations reporting directly to the Air Attache. Many of these positions require language qualifications and almost all require experience in a specific aircraft. Like the overseas Joint billets, there are many excellent remote opportunities available as a military advisor (Turkey, Saudi Arabia, North Yemen, Kenya, and Egypt).

☞

NEWS FOR CREWS continued

Overseas USAF Military Assistance Locations

Indonesia	Zaire	Guatamala
Thailand	Saudi Arabia	Honduras
Korea	Tunisia	Nicaragua
Germany	United Kingdom	Paraguay
Greece	Kuwait	Dominican Republic
Morocco	Kenya	India
Jordan	Panama	Ecuador
Portugal	Bolivia	Venezuela
Turkey	Columbia	Argentina
Spain	El Salvador	Australia

Professional Military Education Faculty

The USAF has rated instructors and faculty advisors at the Air University and other CONUS military schools. Highly desirable qualifications for these jobs include an advanced academic degree and in-residence completion of an equivalent school. As a faculty instructor, you would be involved in daily class lectures and presentations, preparing instructional material, assisting in overall course design, and doing research for various levels of AF management.

PME Faculties

Armed Forces Staff College
Air War College Combined Air Warfare Course
Air Command and Staff College
Leadership and Management Development Center
Army Command and General Staff College
Army War College
Navy Command Staff College
Navy War College

Selection for Departmental/Joint

The assignment process for rated Departmental/Joint positions is very competitive. We review *every* rated officer entering the "available cycle" (DEROS, stabilized tour completion, rated supplement completion, or graduation from in-residence PME) or the "eligible cycle" (3 years time on station and completion of the 6 year gate) for possible Departmental/Joint nomination or assignment. The graduating classes from intermediate and senior service schools can expect to be looked at closely.

How to Apply

If you're interested in competing for a Departme Joint position, the place to start is the AF Form 90- us exactly what you are a volunteer for (pentagon, seas, etc.), then use the back of the form to relate expanded preferences and qualifications. Since Departmental/Joint organizations are of limited size highly specialized, timing is critical. The job you (and may be highly qualified for) may be open next m or may not be available for several years. Further nominative aspect of the Departmental/Joint assign process, combined with the dynamic international tary-political situation, requires that each positio worked on a responsive, individual basis to meet an ing need.

We have some of the best jobs the Air Force h offer and we want to make sure that you're aware the details. If you're interested in any of these oppo ties and have questions about qualifications, locatio timing, please call us at AUTOVON 487-6261/ or write HQ AFMPC/MPCROR1, Randolph AFB 78148. Your interest may be the first step towar most challenging and rewarding assignment of your c — we'll be waiting to hear from you. ■

About The Author

Major Karp is the Chief of the Rated Departmental/Joint Career agement Section at AFMPC. He has also served as Deputy Ch the MPC Fighter Shop and was the F-15 resource manager. Karp's flying background includes multiple tours in SEA and in as an F-4 pilot.

ON'T BREAK A GOOD HABIT

t was unreal—like a dream or
a nightmare. You couldn't really
eeing and feeling what had just
ened. Let's see. Go back in your
l over the last few minutes. You'd
flying Number Two. It was in
e dying moments of the day when
still not dark enough to see lights
but too dark to see form and
on. Lead had made an easy turn
itial and you were holding well
osition with 85%. He pitched.
count one and two, and pitch at
Nice and easy. Boards out, speed
Boards in. Holding 85%, gear.
a voice from the tower:
Ghost Flight, turn your lights
right."
ou reach and flick the switch.
for the turn to base. Where is
l? There he is. Well clear—
ds out now for descent on base.
off a couple per cent. Bleed the
l back to 200. Looks nice—good
of descent established.
Ghost two gear down and
ked." Lead still in sight. Okay,
lout. Check the airspeed: 175.
weat! Just leave the power on
roundout is completed. Now
r off and touch it down. Squawk!
e! Horrors!! No landing gear.
ll, it's too late now. Might as
stopcock and slide it out. Yes, the handle is still up, the horn is blowing and the light in the gear handle is ON."

How did it happen? Well just as you thought "gear" after the pitchout, the tower said, "Turn your lights on bright." You flicked the switch. This action somehow filled the habit pattern which normally is satisfied when you place the gear handle DOWN. It doesn't matter that your lights were already on bright and you turned them to dim, or does it? Did your "conscious" say, "The lights are already on bright but the gear is UP," and did the "subconscious" say, "Rog," and tell the hand to move the light switch? Who knows?

We have an old phrase to describe cases like the above—habit pattern interference. It could also fall under the label of distraction. Regardless of the words, the act—or lack of an act—is the important thing. You've just read a case of lack of action—not putting the gear down. Here's the opposite side of the coin—action, but wrong action.

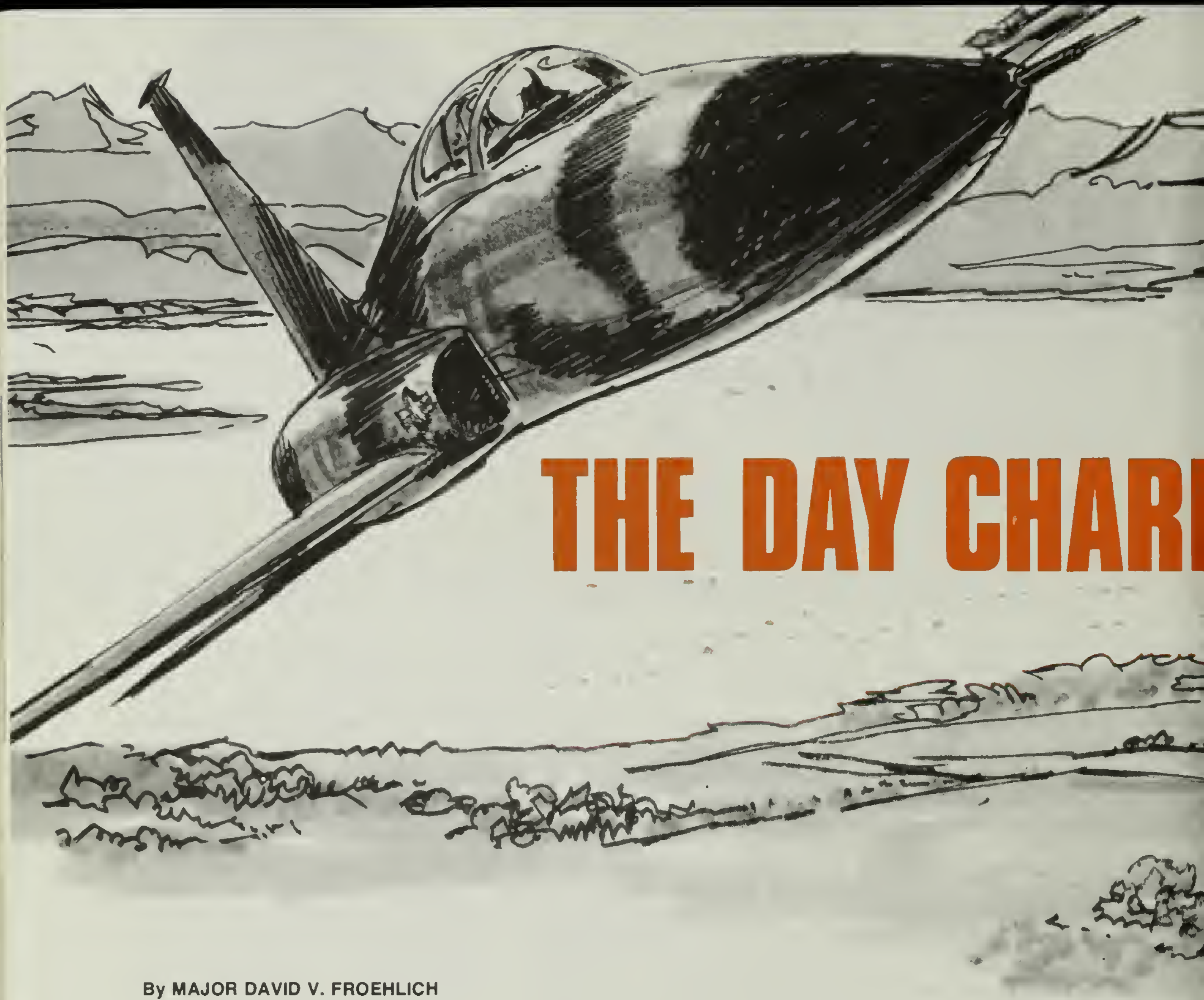
During a B-52 MITO the copilot inadvertently flipped the gear up lever and the airraft headed for the side of the runway. The IP, on the jump seat, recognized what had happened and briskly moved to place the switch to gear down. Steering was once again available and the aircraft was steered back to a straight track.

In this instance, both the co and the pilot in the left seat were attempting to reach another switch and the copilot, while looking outside, got the wrong switch.

Every single one of us, no doubt, occasionally has such a lapse, although not necessarily in our aircraft. Could be in your car, at your desk, while hunting, fishing, driving or just puttering in your garage. Sometimes the situation is forgiving; at other times not.

We have a lot of crutches in our aircraft to (1) prevent or (2) mitigate the effects of a wrong action even lack of an act—noise, lights, etc. They don't always do the job. So it's up to you, the crew—one or more—to be aware of what is required and not allow yourself to be distracted.

Easy to say? Right. Hard to always do? Right. Sorry, there isn't any easy answer. But we can reduce this problem to a minimum by knowing all there is to know about the mission, the equipment, and its proper use. In two words: Fly Smart! ■



THE DAY CHARL

By **MAJOR DAVID V. FROEHLICH**
Directorate of Aerospace Safety

■ *Author's Note: Charlie is a fictitious flyer. He is the guy who sat in the left seat, flew on my wing "up North," yelled at me from the back seat or hovered over me while I was pulled up on a cable. Charlie is the aviator that has the mental and physical ability and skill, but through some disregard of rules, limits, or flight discipline, he kills himself (and mayhaps others). We have had two previous episodes of the demise of "Charlie's" but the scenarios never seem to end. Those of us who fly, either have known or will know, a Charlie, before he dies.*

Charlie doesn't just strap on his Eagle jet— he becomes a part of it. After a couple of years, now, he has really become comfortable in the machine. Charlie paid his dues and now rides proud. He came out of UPT just at the end of the "conflict" and grabbed a Phantom. He worked at being good and was! He studied, sat in on extra briefings, took extra looks at films and asked a lot of dumb questions. In the beginning, he took a ration from the old heads at the watering hole, but soon the jibes turned to respect as Charlie gained the reputation of sharp eyes and good hands. As he approached the top of the heap, he was given the chance to go aggressor or Eagle. He chose the latter and began his climb all over again. "He done good!"

It was to be a normal mission. normal as one of those complex, very realistic and crowded, ingre egress bad guys jump good guys scenarios could be. Charlie was a meticulous as ever. He studied an reviewed players, equipment, terrain, and all the parameters. H briefings and questions/comment left no confusion. The participan were skilled, briefed, experience the weather was cool and clear— the machines all FMC. Nothing could go wrong . . . but it did.

The launch was smooth, and th players headed out to positions. Charlie's flight was tasked to pro bomb droppers throughout their ingress/egress route. Things were going along quietly until just prio

ED

target. A flash caught
e's eye about the same time
vo told him they had company.
twisting, turning, and
ng began as the aerial ballet
ped. The Eagles were pretty
holding their own against
F-5 aggressor folks, but
e found himself being pushed
lower and slower. He was
g hard and calling up all the
hat were stored in his mental
ter. In an instant, Charlie saw
nt and pulled. He flat-plated
beautiful, blue-grey Eagle
the same instant thought
that guy's good, but he just
ommitted an inch and now I
e him."
ortunately, in that same split
there came a "KNOCK IT OFF, KNOCK IT OFF" over the crowded UHF frequency. I think somewhere, deep down inside, Charlie heard. It was just that his whole being — mind, body and soul — were wrapped up in gaining that single, small advantage that means a victory. The radio call just didn't register! Charlie stayed with the fight.

Maybe the back-seater in the Phantom saw the Eagle or maybe not. Either way, it was probably too late. Charlie never saw or knew what happened! One second there were several beautiful machines seeking each other in the sky and the next instant two were welded into a single fireball and tumbling earthward. No ejection attempts — two aircraft lost and three fatals.

Nobody ever pushed Charlie to be the best, or to win at *all* costs. Charlie pushed himself! It's been called press-itis, mental-set, or the mission-completion syndrome. They are all as deadly as the bandit in a comfortable six o'clock.

To be victorious, one must have the desire, but to let that desire block out all else is to ask for disaster. All that remains in Charlie's story is for the dusty blue USAF sedan to pull up in front of his quarters. The grim and uncomfortable occupants will walk past two small rug-rats playing on the lawn on the way to see Charlie's wife. What a waste! ■

Where I Did I Say I Was?

By CDR V. M. VOGE, MC
Naval Safety Center

■ *Another in a series of articles on vertigo and disorientation from the USN* Approach.

Flicker vertigo. Flicker vertigo is usually caused by a flickering visual stimulus. Although this illusion is probably more common to you helo driver, the jet jocks and prop drivers also can be affected. How, you ask? Well, how about the spinning prop and an appropriate sun angle. This can result in a flickering light stimulus that can cause flicker vertigo. You jet jocks aren't immune either! How about when you're in the clouds and your strobes are reflecting off of them? (And you always wondered why you're asked to turn off the strobes in clouds!) Not only this, but flashing, anticollision lights can also illuminate the cockpit, either directly or by reflection from clouds or snow.

Okay, now that we know how the *flicker* gets there, how do we know when we've got flicker vertigo?!? Most aviators describe a feeling of nausea, dizziness, irritability and/or distraction, along with feelings of uneasiness, nervousness, drowsiness, headache, or even severe pain. Occasionally, an aviator will report *true disorientation,* in which he feels as if he is turning in the direction opposite to that of the moving shadow. In a few, rare, severe cases, people have become unconscious or have suffered epileptic-like seizures (fits or convulsions).

All this sounds a little strange, doesn't it? It is caused by the frequency of photic (light) stimuli to the brain. A medical officer will frequently use a strobe light during an electroencephalographic (EEG) test to try to induce seizures in patients. (Remember your preflight physical?) The same mechanism is present here. Unfortunately, and usual with vertigo and disorienta problems, you will probably not realize what is happening to you Although the possibility of your being affected by this form of vertigo is slight, the results understandably could be catastrophic!

The cure—easy, usually. Sim get away from the flickering lig Change course, turn off the stro or anticollision lights, or change your field of vision. If you find are suffering from flicker vertig and are in a dual-piloted aircraf close your eyes and turn your h away, *briefly*. You needn't mak production of it!

Circularvection and linearvect These are two illusions produced a movement in your peripheral of vision. This will give you a fe of self-motion. If it is a false se of rotating motion, it is called *circularvection.* You might experience this from the revolvi reflection of your anticollision l off clouds. It also can be produc on the straight-and-level, parall

rmation flight when aircraft are ing at different speeds.

If the sense of motion is linear, it called *linearvection.* How many nes have you stomped on your kes at a stop light to keep from ling backwards when the car next you actually has crept forward? is illusion can be produced when o aircraft are ahead of you and are idly separating. You feel as if an craft is approaching you. This o occurs when your approach to a ed object is misjudged, and you l as if the object is actually ning towards you. This illusion bably explains some of the blems a few of you had when u first learned formation flying.

splacement of horizon. splacement of the horizon can ur in several different scenarios. hts normally provide you with ical information, e.g., horizon, tude, runways, traffic patterns, ition in formation, and type of raft. This illusion primarily olves a misinterpretation of the aning of the lights you see or of distance and appearance of the ect at night as compared with its earance in daylight. It is erally associated with night ng and certain other conditions. mples:

At night, approaching ground ts may be confused with stars, ng you a false horizon. pending upon the lights' relative ntation in relation to the horizon flight direction, it can give you feeling that your aircraft is ng. Some pilots have even orted feeling inverted! A few of have been known to interpret shoreline lights as the horizon to maneuver your aircraft a little close to the murky depths. ough this doesn't happen all that uently, you can well imagine the sequences!

When flying over a sloping d deck or sloping terrain, out visual reference to the earth's surface, you may experience a visual form of the *leans*. This can be extremely annoying and may dangerously affect your flying efficiency. The tendency is to accept the sloping terrain/cloud deck as the horizon, ignore the attitude indicator, and align the aircraft with the perceived horizon.

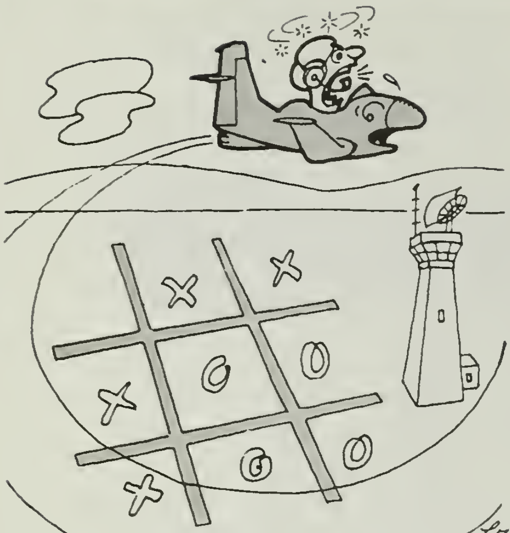
■ Ground lights can be confused with stars. This can result in rather bizarre aircraft attitudes in order to keep the "stars" above you! You also may misinterpret your approach to a star or fixed beacon as though you were following the tail lights of another aircraft in formation! Ever join up on a star?! Whenever you're flying in a sensory-deprived environment (few visual cues), your requirement for some point of fixation makes you susceptible to this illusion. You are more susceptible to these illusions if you're under stress. Your best defense against it is to *be aware* of the problem (which you are now) and to watch for it. Also, watch your instruments. A proper scan is of upmost importance!

Another illusion and space myopia. Another illusion, with no specific name that we are aware of, occurs when you suddenly shift your attention from outside the cockpit to inside the cockpit (to the instruments). Although the eye's ability to accommodate is almost instantaneous, it may require up to 45 seconds for your *mind's eye* to become completely reoriented. Some serious problems understandably may develop during this time period, especially when you consider that this type of shift in attention is often the result of a developing problem with the aircraft! The reverse of this is space myopia, where your eyes remain focused to near vision (cockpit, wing, etc.) while you're scanning the sky for playmates. Solution: *Be aware* of the problem, and get on the instruments in the former case. (We're beginning to sound like a parrot with a very limited vocabulary.) In the latter case, try to find some far-off, visual point of reference to focus on.

Approach and landing problems. As we stated above, when we don't have all our normal visual cues, or they are not what we've become accustomed to, we can make errors of perception. We can overestimate distance in degraded atmospheric conditions, e.g., fog, rain, haze, or snow. If you are making a visual approach, you may feel that you are higher or farther from the runway than you actually are. Your approach may be high, and you may overshoot. On the other hand, if you've become used to flying in the "muck" and the atmospheric conditions are better than what you're accustomed to (e.g., clear, bright conditions at a high altitude airfield), you may feel things are a bit closer than they actually are.

As we explained above, darkness deprives you of a generous amount of your visual field, and you no longer have the various daytime visual cues to depend on. You then rely on what is called your *angular*

"I know this sounds flakey, Bub, but I've misplaced the horizon . . ."



"You're just saying it's an illusion because it's my turn!"

Where Did I Say I Was continued

subtend, or the relative size of the runway and approach light pattern on the back of your eye (retina). This is more difficult if you are making a "black hole" approach (over water or unlighted terrain, for the uninitiated). Many pilots feel that they are higher than they actually are under these conditions and fly a low approach. You can also misjudge distance from the runway threshold (bright lights = underestimation of distance; low lights or poor atmospheric conditions = overestimation of distance).

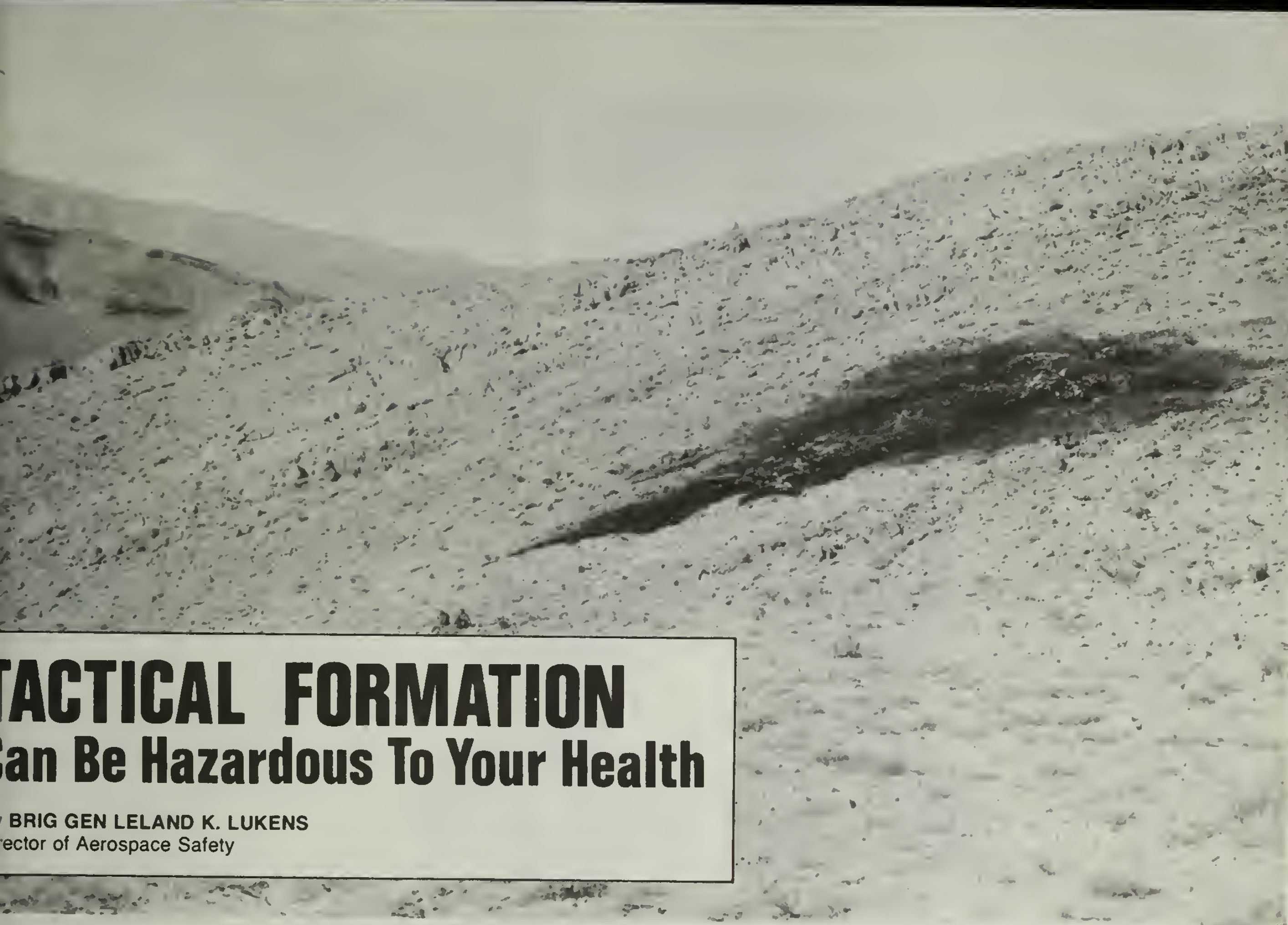
The runway and surrounding terrain may cause you problems. You may tend to make a low approach and land short on a runway which slopes up from the threshold. Why? You overestimate your altitude and distance to touchdown. Conversely, you are more likely to make a high approach and land beyond the threshold if the runway slopes down. All this happens because your *mind's eye* tries to match up the image of the sloping runway with what it's become accustomed to on the more familiar flat runway using a 2½- to 3-degree glide slope (assuming you normally land on flat runways, of course).

The same problem can exist when you approach a runway with dimensions that are different from those to which you're accustomed. An unusually wide runway will tend to cause you to underestimate distance, and an unusually narrow runway will tend to cause you to overestimate your distance from the threshold, leading to landing long or overshooting. To carry this just a bit further, the confusion can be even worse on those runways that preserve the expected length/width ratio, but are wider and longer or shorter and narrower than expected.

Last, but not least, local topography is important. An approach over generally featureless terrain ("black hole" approach, smooth sea, snow-covered ground, night conditions over water or dark terrain) can cause serious errors in your perception. Sloping terrain can give a false perception of height just as can sloping runways.

The big problem with these illusions during approach and landing is that you just don't have much time and altitude to correct for any misperceptions. The decision to shoot a missed approach must be immediate, if you're going to avoid a coveted place on the Safety Center's computer tapes! The illusions mentioned above usually don't occur one by one, but rather occur in various and sundry combinations, just to confuse you further. Your error will be one of judgment and inappropriate control. How to avoid this one? Be aware! Be alert! And remember, not all approaches can be saved. Swallow your pride and go around. After a[ll] we need all the landing practice w[e] can get, don't we?

Polaroid sunglasses. Ever wonde[r] why polaroid sunglasses are a "no-no" in the cockpit? Well, the[re] are various reasons, most of whic[h] we won't go into. As far as disorientation is concerned, however, the Safety Center receiv[ed] a report which described a strange illusion of a pilot while wearing polaroid sunglasses under a clear visor. He was flying low, over th[e] ocean, in the late afternoon. He looked at a ship underway in the distance, and the forward part of [the] hull appeared to be suspended ove[r] the bottom of the ocean! Because [of] the sun angle, and his polaroid sunglasses, there was no reflectio[n] from the water. The aviator was disturbed and described the feelin[g] as "disconcerting, to say the least[."] He asked us whether any collided-with-the-water accidents could ha[ve] been caused by this phenomenon. We don't know, as after someone has collided with the water, there isn't anyone left to talk to. We would probably never find the sunglasses, anyhow. What caused this illusion? Hard to say. It could be attributed to any number of factors, e.g., effect of the visor o[n] the glasses, make of the lens, pris[m] balance, light ray bend, etc. (We [do] know that certain windshields tenc[d] also to polarize light, especially n[ear] curves or angles. Certain combinations of orientation of polaroid glasses versus such a windshield might be expected to block light transmission and produ[ce] black splotches— which, in fact, happens.) We also know that polaroid glasses are designed to cu[t] glare from the water's surface by polarizing the light rays. They are even advertised for use by fisherm[en] to *see* the fish through the water! Solution? Simple! Don't wear polaroid sunglasses. Use only authorized, standard issue, (Air Force) sunglasses. ■



TACTICAL FORMATION

Can Be Hazardous To Your Health

BRIG GEN LELAND K. LUKENS
ector of Aerospace Safety

e fly a lot of tactical ation. That's great for lookout. ows good cross coverage and al support. It is vital in both at and training— a Cessna 172 e as effective as a SAM. But d formation at low altitude can ry hazardous to your health. 's take a look at three stories, which involved low-level d formation and had unhappy gs.

e first one is about the lead nt of a 4-ship ingressing to a al range target. The wingman the left, spread 4,000 to 5,000 ut. The leader has the task of the element around a tain that is standing in the He begins a right-hand turn to ound the north side but changes ind and reverses to go around uth side. The wingman has y committed himself by ng to the right turn and is a low picking up the reversal. thrown to the outside, and before he can get out of there, he bounces off a ridge line on the mountain. Since this is the luckiest day of his life, he is able to successfully eject before his machine hits the second time. Scratch one airplane.

The second story is about a 2-ship returning at low level from tactical range work. The wingman is on the right, spread 3,000 to 4,000 feet out. It comes time to climb from 600 feet or so to initial approach altitude. The leader makes a 3 G, climbing 60° tactical turn into the wingman. When the leader looks for his wingman, he finds him on the inside of the turn, nose low and very close to the ground. As the leader calls for a roll out, the wingman hits the ground. Scratch one airplane and two crewmembers.

A third story concerns a 2-ship on a local orientation and low-level mission. During the descent for low-level entry, the wingman on the right is told to go fighting wing. Lead begins an aggressive right turn, and the wingman is observed crossing behind. Radio contact is lost, and there is a fireball at Lead's 6 o'clock. Scratch another airplane and two more crewmembers.

There are several things that are common to all of these true stories. They all occurred in the low-level environment. They all occurred during a turn. The wingman was the loser each time. Another interesting fact is that in all three cases the units were in a deployed status. In two of the three airplanes there were two crewmembers. All three mishaps were preventable.

Low-level tactical maneuvering is very demanding. Wingman consideration is an important part of our leadership, but the ultimate responsibility rests with the jock at the controls. Beware the ground; it's as deadly as the SAM or MIG. ■

CAPTAIN
Raymond F. Haile

CAPTAIN
John F. Bridges

CAPTAIN
John D. Hauck, Jr.

STAFF SERGEANT
Joe N. Bolden

TECHNICAL SERGEANT
Edward F. McConahy

30th Military Airlift Squadron
McGuire Air Force Base, New Jersey

■ On 8 February 1980 a C-141 departed McGuire AFB on a local training mission. Captain Haile, flight examiner, was in the right seat, and Captain Hauck was in the left seat for AC upgrade training. Staff Sergeant Bolden was at the flight engineer's panel. Captain Bridges and Technical Sergeant McConahy were also aboard as third pilot and scanner respectively. On the initial takeoff, as the aircraft reached approximately 110′AGL and 130 KCAS, it abruptly entered a 30 degree left bank. While the pilots fought to control the roll and gain altitude, the scanner reported that the left aileron appeared to be jammed almost full up. The crew was able to regain some control through the use of full right yoke, full right aileron trim, rudder and differential power and managed to climb the aircraft to 5,000′AGL. Even after the continued use of control inputs, the aircraft maintained a 10 degree left bank. A conference skyhook was established. For the next three hours various solutions were tried while the pilots took turns hand flying the aircraft. The crew discovered that depowering or selecting tab operable on the left aileron only served to aggravate the problem. After these and other unsuccessful attempts to alleviate the problem, the crew climbed the aircraft to 10,000 feet and performed a controllability check with 60 degree flaps and gear down. In this configuration, they were finally able to level the wings and, in fact, were able to obtain a few degrees of right bank. After the successful controllability check, a decision was made to land at NAFEC, Atlantic City, NJ, due to the more favorable runway/wind direction. The approach was flown to 160 KCAS and was otherwise uneventful. Subsequent investigation by Warner Robins Air Logistics Center revealed that the jam was caused by a stainless steel bolt which lodged at the pivot point for the aileron tab drive push/pull rod. The quick thinking, rapid reaction, and outstanding crew coordination of Captain Haile and crew was instrumental in averting a serious aircraft accident. WELL DONE! ■

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TATES AIR FORCE

Well Done Award

esented for
ding airmanship
professional
rmance during
rdous situation
nd for a
nt contribution
to the
States Air Force
dent Prevention
Program.

FIRST LIEUTENANT

Michael V. Ely

96th Flying Training Squadron
Williams Air Force Base, Arizona

■ On 24 March 1980 Lieutenant Ely was administering a final contact check to a foreign student in a T-37. While maneuvering in the area, a violent explosion racked the aircraft, the cockpit filled with a dense, suffocating smoke, and the left engine fire warning light illuminated. Lieutenant Ely assumed aircraft control, completed procedures for smoke and fume elimination, and performed bold face steps for emergency engine shutdown. Lieutenant Ely guided his student through the Before Ejection checklist as he simultaneously began an emergency descent to the auxiliary field directly below them. During the spiraling descent, Lieutenant Ely coordinated with air traffic control and the auxiliary field for cleared airspace and crash response. While maneuvering for a single engine overhead pattern, he reviewed specific actions he and his student would accomplish during approach, landing and ground egress. Throughout the recovery, smoke continued to enter the cockpit, significantly reducing forward visibility. Upon touchdown, Lieutenant Ely applied maximum braking techniques, stopped straight ahead and egressed on the runway. As they exited the cockpit, flames erupted from behind the student's seat. The fire was extinguished before significant damage occurred due to very rapid crash equipment response. The elapsed time from the explosion to the fire being extinguished was approximately three minutes because of Lieutenant Ely's quick action, close proximity to the auxiliary field, and the rapid crash response. Maintenance investigation revealed a sequence of multiple system failures which probably produced the emergency. It is considered highly probable that an existing bleed air leak ignited wiring insulation, which, in turn, ignited an existing but minor hydraulic leak, resulting in the explosion. The force of the explosion probably caused major oil loss with subsequent oil fire and smoke in the cockpit. There was less than a pint of oil remaining in the system. Lieutenant Ely's superior airmanship and thorough knowledge of aircraft systems probably prevented the loss of a valuable aircraft and crew. WELL DONE! ■

This durable yet versatile workhorse has a distinguished record whose end is not yet in sight.

AEROSPACE

AFETY • MAGAZINE FOR AIRCREWS DECEMBER 1980

Director's Holiday Message

■ The holiday season is here, a time of celebration, thanksgiving and happy giving and receiving. It is also a time of assessment of what we have accomplished during the past year and where we are going in the year ahead.

This past year has been particularly good to me. This is my first Christmas as the Director of Aerospace Safety, and our aircraft mishap picture has considerably improved over last year. Both the number of Class A mishaps and lives lost have been drastically reduced, for which we should all give thanks.

Our successes, however, should not lead to complacency. The status quo has a way of changing for the worse if we do not put forth the effort to make things better. I believe that we can improve our mishap record, that we can reduce our losses while maintaining the readiness necessary to accomplish our mission. It will mean a lot of hard work, attention to detail, strong management, and leadership on every level. We must attack the preventable mishaps.

In my opinion, you have been doing an excellent job during 1980. I look forward to all of us, working together, doing even better next year. We in the Directorate of Aerospace Safety wish you a merry Christmas and a great 1981. ■

LELAND K. LUKENS
Brigadier General, USAF
Director of Aerospace Safety

ITED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

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hall and MSgt Rick Diaz of AAVS.

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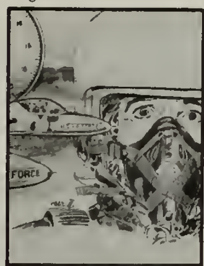

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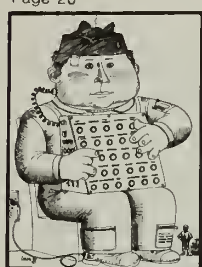

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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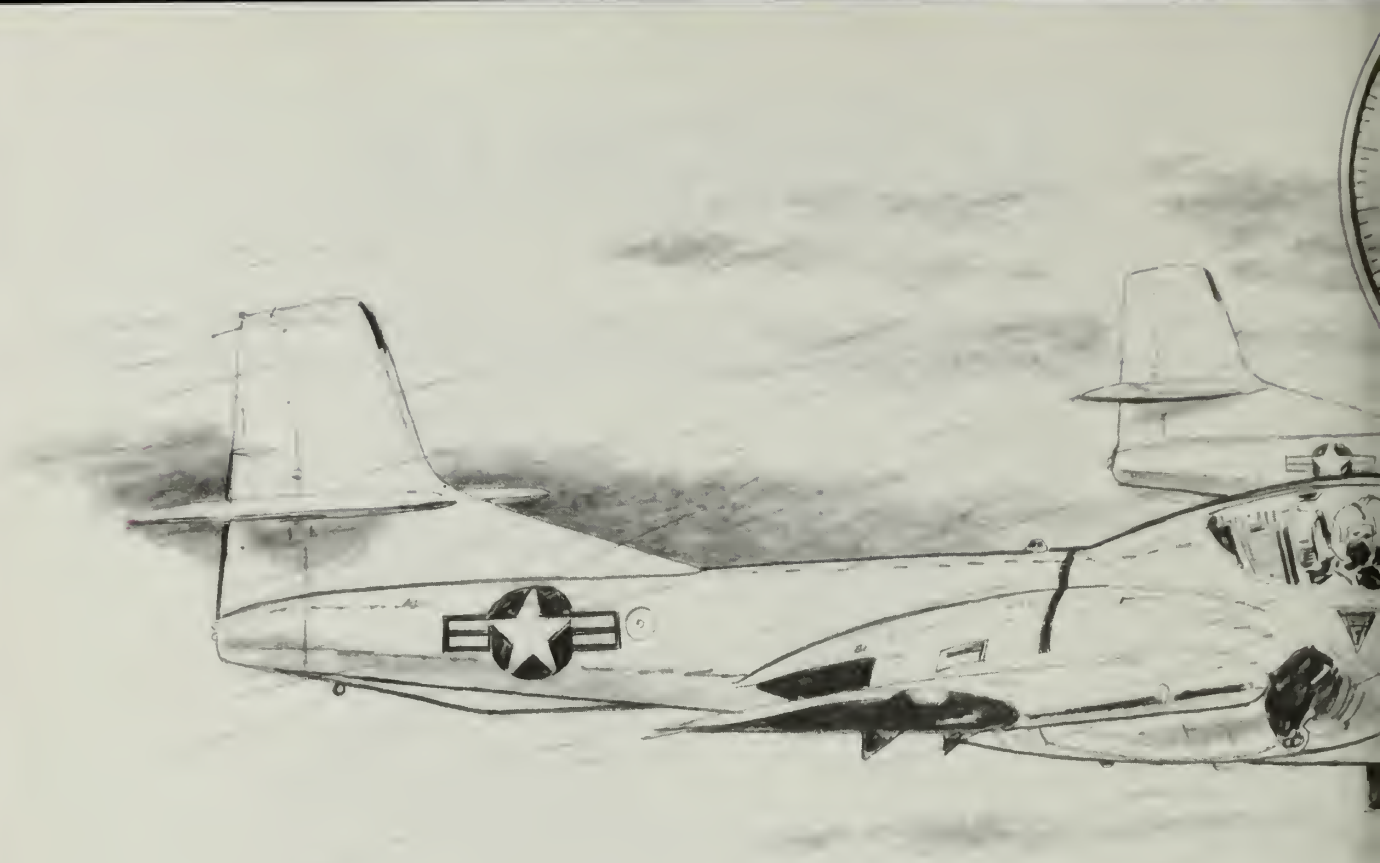


...and a few moments of stark terror

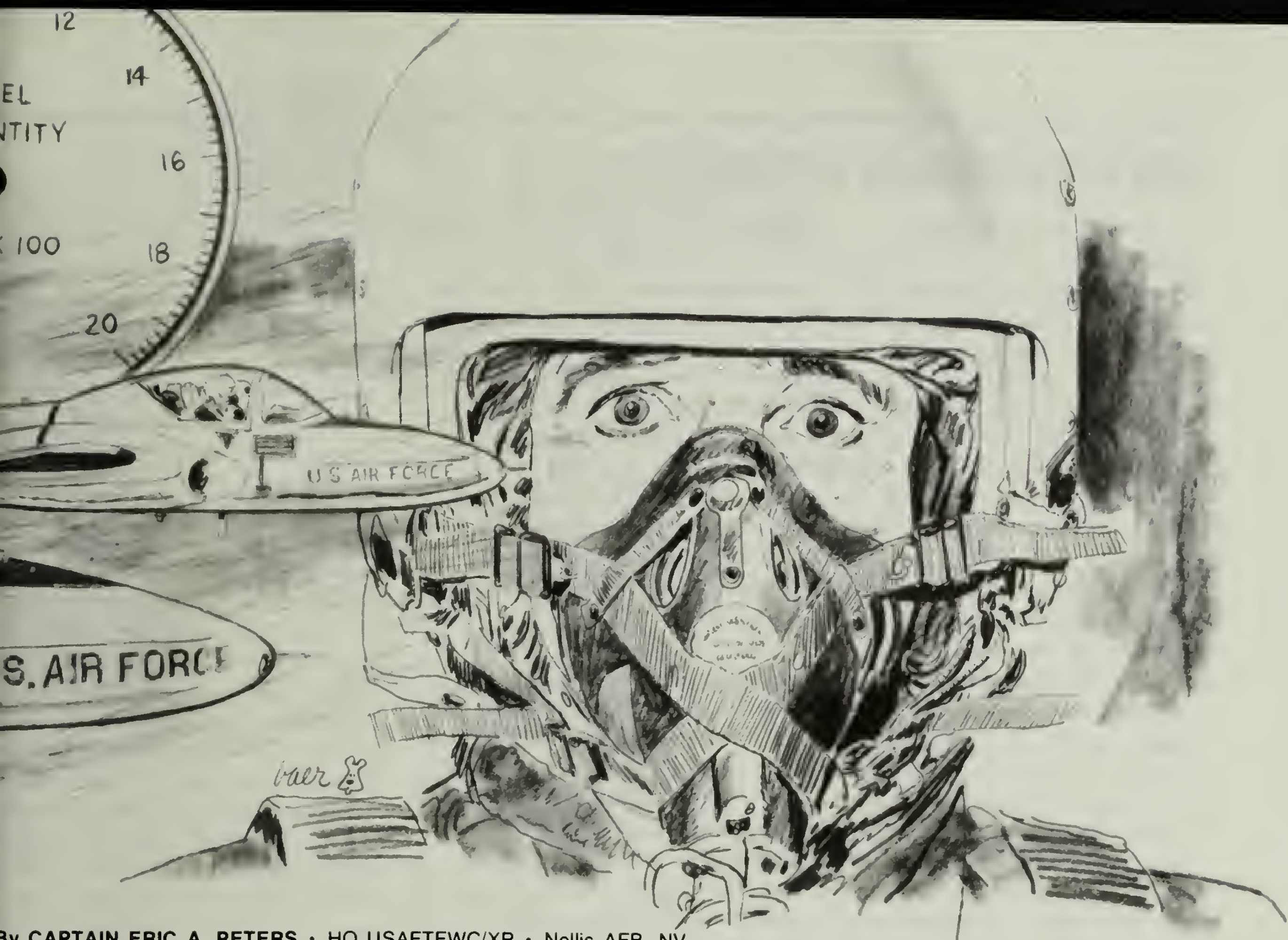
■ I've been meaning to sit down and write this article for years, but being the unofficial President of Procrastinators International, I've put it off. No particular reason has prompted me to do it now, except that being desk-bound, naturally all my idle time is spent thinking about flying.

What I'm about to relate to you happened about eight years ago, so many of the particulars and specifics of the story have been clouded by time and many more experiences. Bear with me though, and perhaps you'll be able to relate to this story. If you can't relate, you're either kidding yourself or you haven't had the opportunity— yet. This story happens to involve two combat seasoned and highly qualified Training Command instructor pilots and two of their fledgling student pilots on a typical weekend cross-country flight in the venerable T-37. (Now don't let the airplane or the command turn you off. Perhaps the circumstances or the aircraft might be a little different, but the experience could be just as dramatic.)

It had been an uneventful cross-country so far. The students had done a creditable job planning for and executing four sorties since we left our west Texas home station on the previous Friday. As planned, we had RON'd on Saturday night in "Lost Wages," and were in the process of assembling ourselves at Base Ops early Sunday morning to plan the two hops home. Believe it or not, crew rest had been observed (a feat not all aircrews visiting the Entertainment Capital of the World can boast). We were as fit mentally and physically as could be expected with one day off in the last 14 (not atypical of ATC in those days). The itinerary called for a refueling stop at Albuquerque and then on home to catch at least part of the NFL play-offs that were under way at t[...] time.

The leg to Kirtland, a long on[e] for the Tweet, required a little mo[re] precise flight planning and just th[e] right westerly winds to make it w[ith] the required fuel reserves. Becaus[e] of this fact and because of enrou[te] weather, the two IPs decided to gi[ve] the studs a break and plan the ent[ire] flight (in retrospect, a good move). The steely-eyed weather prognosticator assured us that the weather enroute posed little proble[m] and that our sleek silver jets shou[ld] be able to level off well above th[e] reported tops of 20,000 MSL. An[d] you bet, the winds were just wha[t] the doctor ordered—280° at 110 k[...] at our cruising level. Destination weather was VFR with scattered [...] broken conditions at 8,000 MSL a[nd] light rain showers to the southwe[st].

All this sounded very comforti[ng] to us, but our intuition, experienc[e] or whatever you want to call it, to[...]



By CAPTAIN ERIC A. PETERS • HQ USAFTFWC/XP • Nellis AFB, NV

s to investigate a little more. The ntrepid flight lead then called and alked directly to the Kirtland veatherman. Not surprisingly, we ound that the teletype reports were lose to his own forecast. So, armed vith the information we set about lanning the event. We elected to equest radar vectors to our planned ourse and altitude (FL 250) and not o use the heater until level off standard procedure to save a few ounds of fuel, although nsubstantiated in the flight nanual). We figured the winds onservatively at 90 kts instead of he reported 110, and our start escent point was planned to provide s with the most time at altitude.

When we discussed our departure lan with the Base Ops dispatcher, e was unable to "guarantee" us ur requested radar departure and he proposed traffic routing was oing to cost us more precious fuel. Vhoa, Silver—let's get on the horn and talk to some supervisor about this. "Hello, Ops Officer? Here's what we have. Looks like we'll be stretching it a bit—got any advice? You say maintenance has to have the airplanes back by 1400 to get them ready for tomorrow's flying schedule? What? Take off VFR and stay beneath the weather until 30 miles out, then climb and get our IFR clearance? No, sir, we're not anxious to spend another night in Vegas. I'm just giving you the facts. Yes, sir, we'll take another look at it." Back to the drawing board and micrometer.

Here again, the little buzzer went off—better have a go-no-go point midway in the route to allow us to escape to the south in case the weather deteriorates or the winds are less than expected. We'll call Center, METRO, and FSS at that point for the latest weather info and make the decision. The "warm and fuzzies" are abundant now. Time to file the flight plan and get our formal weather briefing.

The DD 175-1 was prepared with virtually the same info we'd received on our initial query. The flight lead made one last call to destination and was relieved to hear that conditions were still copacetic. So how come there's something gnawing at me. Must be a little tired.

Armed with meticulous flight planning and the latest weather information, the fearless aviators launched into the murky gray. Clearance delivery raised our spirits greatly as they relayed approval for our radar climb on course. Good formation takeoff, and after what seemed like an interminable climb we leveled at FL 250 still in the cirrus. Funny, I thought tops were at 20,000. Oh well, we'll probably be out of it in a few miles. Fuel check was good. Our conservative flight planning was paying off. ☞

...and a few moments of stark terror continued

Everything was progressing normally as we approached our go-no-go point, although still in the weather. (For those of you who may have forgotten, the Tweet is unpressurized and limited to 25 thousand.) We queried Center on any weather activity ahead of us and were assured of no more than the status quo. A quick call to FSS and the closest METRO told us that Kirtland still was calling for scattered to broken conditions, winds within limits, and light rainshowers to the south and southwest *slowly* moving to the north. Fuel was on schedule, although we had discovered the winds aloft were in the 60-70 kt range instead of the 110 kt forecast. Decision made—press on to ABQ.

About 100 miles out, Center decided they'd like to start us down, but we talk them into our plan and stay at altitude, still in the weather for a few miles farther. Fuel still OK. Descent check and start down. So far so good, huh? Time to go to Approach Control and request a straight-in ASR (PAR not available at Kirtland).

"Fungo 21, descend to 10,000. Hold south of the vortac on the 180° radial, left-hand turns." Uh—pardon me, Approach, but we'd like to continue our enroute descent to a straight— "Negative, Fungo 21, the FIELD IS BELOW MINIMUMS. Have two airliners below you at 9,000 and 8,000!"

Geez, how come it's getting so turbulent? Can't write down the instructions. Better check my wingee. Wow! Is he ever bouncing around. Sure is getting dark. Stanley—get that approach chart out and find that holding pattern. Can't hold this thing level, it's so turbulent. What's that blinking? The low level fuel light, dummy. Remember, this was a long hop! What!! The holding pattern isn't published?! "Approach, say again our holding instructions." "Roger." Come on brain, where are those mountains around here? When are they gonna turn this rough air off. Boy, two looks panic-stricken. No sweat— "Hey, Approach, Fungo flight is min fuel." "Roger." Roger? Hey, these 6,000 lb dog whistles don't hold that much! Fuel lights are on steady now. Wonder if we're anywhere close to that holding pattern? Ain't no place else to land out here except highway or desert. OK, Lord, you got it!

Some of the longest minutes of our lives passed now. Thoughts raced through my mind about how we were going to explain jumping out of two perfectly good airplanes. My student had long since become very silent and I thought for a moment he had returned to the prenatal position. My continual pleadings with Approach seemed to be reaching unsympathetic ears, but at last the controller must have sensed the desperation in my voice as he soon had us on a base leg for the ASR approach. Descending to 8,000′, we finally broke out of the weather we had entered almost *two hours* previously. "Two, stay with me, all the way through landing." Not enough fuel for separate approaches. Whew, on final at last. Quick glance at the fuel gage—ugh! Wish I hadn't looked at that. Two must be fumes only by now.

Formation landings were not practiced in the Tweet and our landing showed it, but we were finally down and heading for parking. The canopies came open and we were immediately drenched by the still heavy downpour. We didn't care, we were down. Unstrap, jump out, and caress the ramp. Remembering the fuel we shut down with, I walked over to my wingman's aircraft and nonchalantly peered at his fuel gage. My trigger-like mind quickly added the two aircraft fuel quantities and the total, folks, was only double digit!

After a brief, silent thanks to m[y] Maker, we trudged off to have a word with the weatherman. "Pardo[n] me, but have you by chance revise[d] your forecast? No? Perhaps you'd like to join us as we look out you[r] handy window?" "Guess I'd bette[r] issue a revision after all, huh?"

End of story. They didn't get th[e] airplanes back by 1400 that day. W[e] walked away from another one, shaken but hopefully wiser. Mistakes? Yes, probably several, bu[t] as you know, hindsight is always 20/20. We had flown right into tha[t] proverbial "box canyon" doing everything as correctly as we thought we could do. Bottom line folks, is *be prepared* for the unexpected. No matter how routine your mission appears to you, Murphy's Law applies. Always hav[e] an out. Don't be hesitant to declar[e] an emergency, don't trust anybody and remember to take your vitamin[s] every day!

It wouldn't hurt all IPs to occasionally place more than cursor[y] emphasis on some of the basics. Your studs may be able to perform the finest double inverted high angle off snatch back to a high deflectio[n] snap shot against multiple bogeys, but, where is he when his jet flames out on RTB due to poor fuel management or he forgets to keep tabs on the marginal weather conditions back home? You've hear[d] all this a thousand times, but isn't it worth the emphasis?

Hey, guys, we got a seat open this weekend. Anybody want to go cross-country? ■

ABOUT THE AUTHOR

Captain Peters is a 1967 graduate of Texa[s] A&M University. A senior pilot with ove[r] 3,000 hours, his assignments have include[d] Forward Air Controller, SEA, T-37 Instruc[-] tor Pilot, ASTRA tour, HQ USAF, Fligh[t] Commander/Instructor Pilot, F-4E, USAFE and Instructor Pilot with the USAF Fighte[r] Lead in Training Wing, Holloman AFB, Ne[w] Mexico. He is currently assigned to the Plan[s] Directorate of the Tactical Fighter Weapon[s] Center, Nellis AFB, Nevada.

OPS topics

\ Hot Time in the RSU

■ Want some action? Try ucking an AN-M37A2 lluminated signal ricochet-ng around the inside of a istressingly small runway upervisory unit (RSU). 'his happened to three tartled high steppers when ne loaded M8 pistol fell ut of the M1 mount and ischarged the signal.

The story goes some-ning like this: A pilot as-igned RSU duty loaded nd placed the AN-M8 istol in the M1 mount. 'wo individuals arrived at ne RSU in support of a ocal exercise. Since the SU was originally de-igned for one individual, ne additional people found he quarters cramped. Vhile the three individuals vere conducting separate perations, they heard a oud bang and the RSU mmediately filled with moke. After the fire was xtinguished, the RSU fficer noticed that the istol was lying on the floor.

So you ask, what ever tarted this sporty action? The sequence of events which caused and could have prevented this mishap were:

WRONG: The RSU officer loaded and then installed the M8 pistol in the M1 mount.

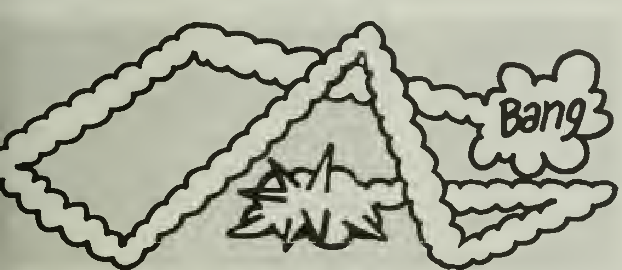
SAFE: The M8 pistol should be loaded with the signal after the pistol is installed in the M1 mount.

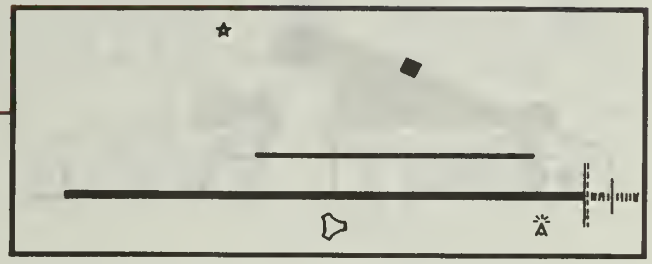
WRONG: The M8 pistol could not be locked into position due to excessive wear on the M1 mount.

SAFE: Make sure that a positive lock is evident when the M8 pistol is secured to the M1 mount.

WRONG: The M8 pistol fell out of the M1 mount possibly by vibration or by accidental bumping because the RSU was overloaded with personnel.

SAFE: The RSU should be manned only with the proper number of personnel and other arrangements should be made for additional personnel during exercises.





Airfield Diagrams

The Defense Mapping Agency (DMA) publishes loose-leaf 5″ x 8″ airfield diagrams for 341 locations worldwide. The information includes runways, taxiways, parking and alert areas, prominent buildings, obstructions and radio facilities. The purpose of this product is to support operations of aircraft equipped with Inertial Doppler Navigation Equipment. However, it can be a very useful flight planning tool for aircrews filing for unfamiliar airports. Check with Base Operations for the availability of this publication. For several years, DMA has been asked to publish full-page airfield diagrams for selected airfields in the Terminal Instrument Approach Procedures books. This product may be available during 1981.—*SMSgt Marshall E. Holman, Directorate of Aerospace Safety.*

Loss of Reset Knob Can Cause Instrument Errors

When a T-38 pilot went to RESET on the AAU 19/A altimeter during the Before Taxi Check, the reset knob fell off in his hand. Since this was a dual flight, the aircrew did not consider this to be a problem and elected to continue with the mission. After takeoff the aircrew encountered erroneous altimeter, airspeed, and vertical velocity indications after climbing through 8,000 feet. Another aircraft joined on the mishap aircraft and a successful recovery was completed.

Investigation revealed that the snap ring which holds the reset knob in place had broken. When the knob came off it permitted a leak in the pitot static system which caused the erroneous indications.

Although we all know this altimeter operates using static pressure, neither AFM 51-37 nor the T-38 Dash 1 specifically mention that loss of the knob can cause a leak in the pitot static system. At any rate, we now know loss of the reset knob will cause the same pitot static instrument errors which occur when the altimeter glass is cracked or broken. This is true not only for the T-38, but any aircraft with the AAU 19/A altimeter.—*Capt. Dennis D. Dailey, Directorate of Aerospace Safety.* ■

Plastic Airplanes Are Coming Your Way

By MAJOR ROGER L. JACKS • Directorate of Aerospace Safety

■ The evolution of the airplane has been dramatic to say the least. From the Kitty Hawk days when an airplane of wood, wire, and fabric putted along on its piston engine skimming the tree tops, to sleek jet aircraft built of titanium and other space age metals blasting through the air at several times the speed of sound. Indeed, aircraft technology has come a long way. However, another breakthrough in aircraft manufacturing has launched us on even a more spectacular phase of evolution.

Over the past ten years a quiet revolution has been developing in aircraft materials. Metals are being partially replaced by carbon/graphite fiber reinforced plastics. A member of the advance composite family which includes Boron, glass and Aramid fibers— a carbon/graphite fiber has a diameter of 0.02mm, finer than a human hair. Thousands of these fibers are put into usable form by incorporating them into plastic binders. The plastic binders impregnated with the fibers are then molded into the various shapes needed for aircraft production. Why the change? As Mr. Leslie N. Phillips, Head of Plastics Technology for the Royal Aircraft Establishment, puts it "The driving force behind this aeronautical transformation is the same as that which took place when light alloy replaced timber— greater efficiency. Designers want better speeds, greater payloads, lower fuel bills and cheaper maintenance. They are prepared to pay for a material that promises these things by being stronger, stiffer, and lighter than light alloy and which does not corrode."

A recent U.S. Government study of energy requirements supports Mr. Phillips' statement by showing th energy savings of composites ove metals can be as high as 33 percen There is an abundant supply of r materials and their conversion to final form costs less than with metals. For these reasons we will probably see an increased usage r by the manufacturers in the comi years. The family of advanced composites already has found a home in the sporting goods indust where manufacturers of golf club tennis rackets, skis, and fishing ro are using the technology extensive Government predictions show the next major industry to turn to composite materials will be the automotive manufacturers.

Advance composites would be good to be true if they didn't ha some negative aspects. One of th

aspects is their ability to be good electrical conductors. That characteristic has an adverse effect when an aircraft containing carbon/graphite composites is involved in a mishap where a fire or explosion occurs. The problem arises when the electrically conductive fibers are liberated as free floating debris during and after the mishap sequence and settle on unprotected electrical circuits. That can lead to malfunctioning electrical equipment.

NASA and DOD became interested in the phenomenon in the mid-1970's. NASA formed a working group and contracted with several private firms to research the problem and identify possible fixes. DOD called the logistic commanders from the three services together to form a working group. An organization called the Joint Technical Coordinating Group (JTCG) was formed to research the problem. They, in turn, contracted with some private research firms for support. For the Air Force, the Rome Air Development Center became the composite fiber research focal point.

In 1978, the JTCG released the HAVE NAME protection guide handbook as a preliminary assessment of the carbon/graphite hazard. The Air Force, working through the safety offices and Disaster Preparedness Offices, established local plans based on the handbook to combat the potential problem. The planning was done on a worst case basis since all the data on the problem was in the infant stage. Aircraft containing carbon/graphite fibers were tracked by tail number by the Logistics Centers and AFISC. In the beginning, two members of the advanced composite family were of primary concern: Boron and carbon/graphite. After the initial research stage, Boron was dropped from the problem primarily because of its heavier weight and higher voltages required to present a hazard. The heavier weight means a smaller chance that the fibers would have a large dispersion pattern and the higher voltage requirements eliminates a significant amount of electrical equipment from potential damage. It should be noted, however, that Boron can be a nuisance or even a hazard for people working around an aircraft mishap containing the material.

Once the Boron fibers are shattered, exploded, or any way broken loose from their resin binding, they leave sharp and brittle pointed strands projecting out from the damaged surface. For the unaware, it can be a painful encounter. They can easily penetrate the human skin, much like a sharp wooden splinter. Solution to the problem is in the wearing of protective clothing and being aware of the problem. No special protective gear needs to be kept on hand, just the normal work clothes with long sleeves and gloves.

As research efforts were concluded, it became apparent that even the carbon/graphite problem was not as serious as first thought. The problem initially had so many variables to consider, that only a best guess could be given until complicated research efforts were concluded. It was better to worst case the problem until enough facts were in to make a more definitive statement.

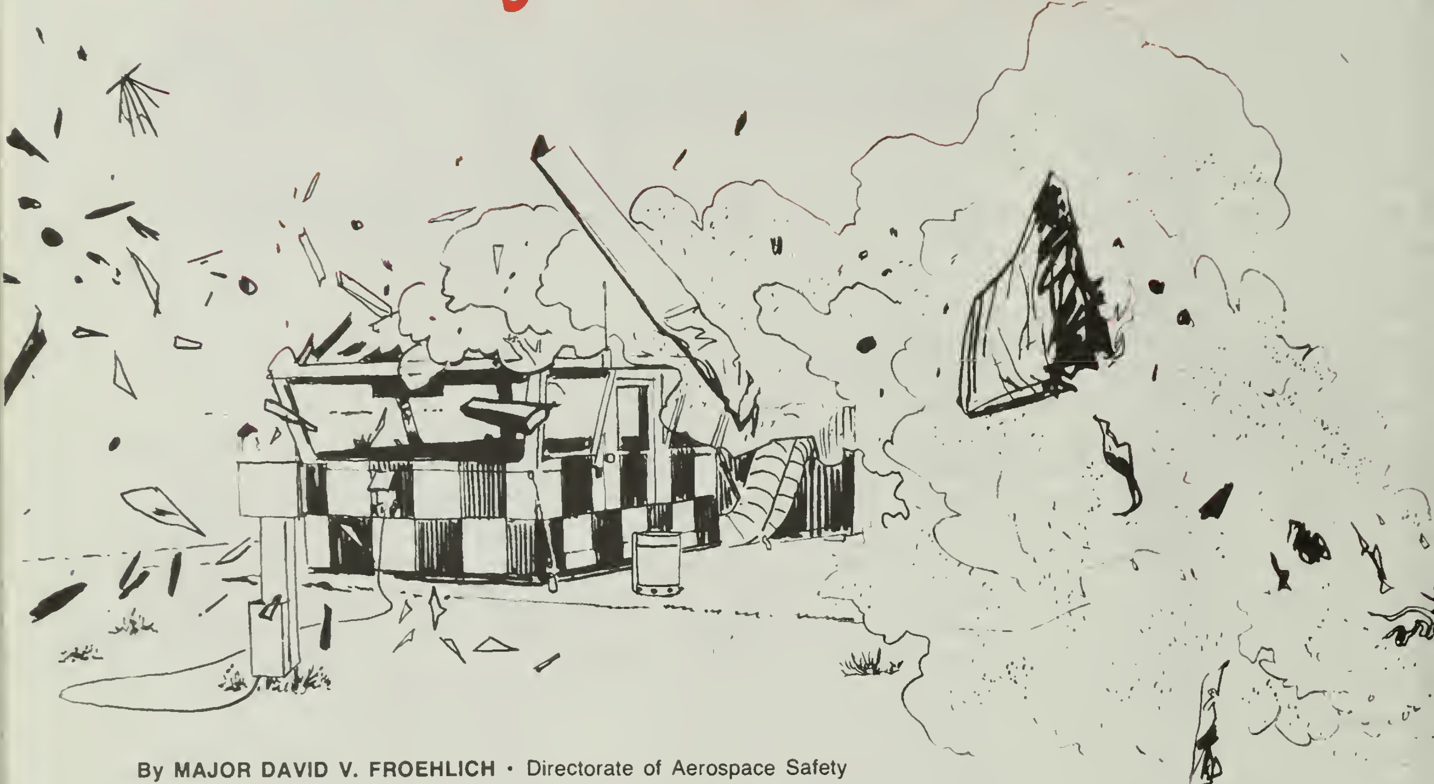
In December of 1979 NASA concluded a 22-month study by stating that the risk of electrical equipment damage from release of carbon fibers from a civil aircraft accident is insignificant. They found that very few carbon fibers are released during burning and that most electrical components are adequately insulated against possible contamination.

The JTCG was still involved in some research efforts when the NASA findings were released. They agreed with NASA on some of their fundamental statements but made it clear that a difference in exposure rates and missions made it imperative that a DOD position be developed. In June of 1980, the JTCG briefed their conclusions to the DOD community. In that presentation, it was stated that the risk to the Air Force was small or negligible. This conclusion doesn't mean that the Air Force carbon/graphite protection program is going to be abandoned. It will, however, be tailored to reflect the knowledge gained in our latest research efforts.

The NASA and the JTCG studies found that there will be a continuing need to clean up the carbon/graphite fiber residue following a mishap. Even though remote, under the right conditions secondary electrical effects can be experienced from a mishap aircraft constructed with these fibers. It will be early 1981 before new documents are available to use for guides in revamping our base disaster preparedness plans. In the past, aircraft or missile mishaps that involved carbon/graphite fibers were called "Corkers." In the future, the work composite will most likely be used to describe or highlight the event.

Until the new guidance on composite mishaps is incorporated into our base disaster plans, the current plans will be utilized. If any doubt exists on actions to be taken or additional assistance is needed, call the AFISC technical assistance number AUTOVON 876-7479. ■

The day Charlie died



By MAJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

Author's Note: Charlie is a fictitious flyer. He is the guy who sat in the left seat, flew on my wing "up North," yelled at me from the back seat or hovered over me while I was pulled up on a cable. Charlie is the aviator that has the mental, physical ability and skill, but through some disregard of rules, limits or flight discipline, he kills himself (and mayhaps others). Those of us who fly, either have known or will know, a Charlie, before he dies.

■ Charlie was a mini-MAC airline pilot! He took some flak from "friends" when he took the job, but after a year or so he realized that a lot of the gibes were coated with a layer of envy. He had really settled in and was enjoying the airplane, the mission and the new outfit. He began to appreciate all the fun little details that non-39 flyers really don't think about.

For instance, his job description probably could have read like the opening scenario to a popular spy-type program which is still being re-run. "Your mission, Charlie, should you decide to accept it, is to take an aging and somewhat under-equipped (by present standards) aircraft, fill it with passengers (including VIP's from Code 2's on down), luggage and small cargo and follow an ever-changing schedule in and out of the crummiest weather you've ever seen. You will land everywhere from the ulcer-producing LAX to somebody's 6,200 foot concrete driveway without so much as a coke machine (let alone a tower). You'll do this 7 days a week, on a lot of 14-hour days (but no more than six stops per day), often with a General in the left seat, and then return home (unless we need you to RON to come out early the next morning). You'll also be part-time Red Cap, coffee waitress, aircraft refueler, system troubleshooter, pax service rep and full time diplomat."

Despite the grinding sound of th above, Charlie loved it! He felt a sense of pride in that, although he wasn't delivering bombs or dodgin bandits, his safe mission accomplishment called for a professional aviator. Unfortunately, the sense of pride probably is wha helped auger him in! Pride over judgment equaled mangled metal.

Charlie and his co had drawn a late afternoon takeoff to transport a three-star and party of four halfwa across the country to an interplane stop, and then return. Should have been a short day and almost a no-thinker, but mother nature had to ge her two cents in. Enroute weather and destination forecast was OK, and the return to home drome looke fairly painless. Charlie had his act together, the machine worked well and they arrived (with General and on-time) at the interplane/gas stop.

Then the plot thickened.

The ominous ''Call MOTHER-MAC'' note was waiting for Charlie as he got to the dispatch counter. The duty officer wasn't pushy. He told Charlie that the General's interplane had crumped, the General really needed to get home and would Charlie mind an unscheduled RON. Charlie checked with his partner and they said ''sure, no sweat.'' (You could almost hear the duty officer's sigh of relief long distance, 'cause this was probably the first thing that had gone right all shift.)

Anyway, the team sprang into action as Charlie headed for the DV lounge to tell the General that they would be a few moments to re-file and add extra gas, but that they would try to get him home tonight. The General was genuinely appreciative, but said if there was any problem he could spend the night here and go on home first thing in the morning.

Charlie headed back to the flight plan room; he found the co putting final touches on the 175 and they went to see the weather folks. TILT! Destination weather is partially obscured with ⅛ mile and fog. Forecast to get better? Nope—about the same. Right about here, Charlie's ''no-go'' light should have begun to flash but as the co watched in disbelief, Charlie began to ask for alternate weather and an AUTOVON number for the destination weather forecaster. ''Can-do'' attitude had begun to overshadow ''Should-do'' judgment. The destination weather forecaster stuck by the forecast and added an unofficial ''And I don't look for any better.''

Charlie was hemming and hawing when the General walked up and inquired how things were going. ''Uh, just fine, sir, the, uh, destination weather's not real good but the civilian airport across town is carrying a better forecast and as

The day Charlie died continued

soon as we have gas we'll be on our way.'' The General again mentioned that he could stay the night here, but Charlie brushed the offer aside with another, ''No problem, General, we'll get you home.''

The still dumbfounded co could only get out a ''but, but . . .'' as Charlie nudged him toward the door and said ''Get started on the walkaround and I'll finish filing and bring the passengers out.'' Can do had taken over should do, but Charlie was to have one more chance for a reprieve.

By this time it was severe dark outside but Charlie was still breaking speed records down the parallel taxiway headed for the active. About the time Charlie rounded the last corner on one wheel, the right side attitude indicator tunbled. Dutiful copilot spoke up but Charlie only responded with ''What! Check the circuit breakers! Oh well, mine's OK. We'll watch it closely; tell tower we're ready!'' (One more nail in the proverbial coffin.)

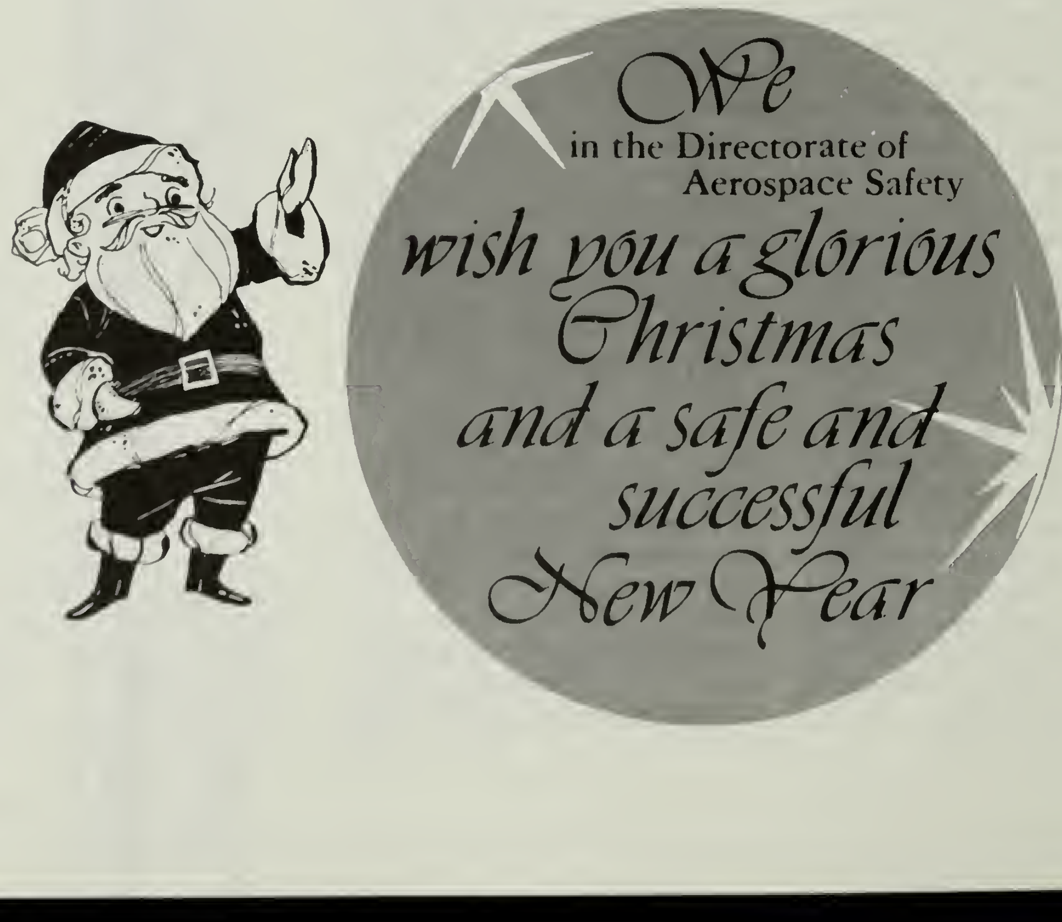
Two hours later the aircraft was descending past FL 240 in an enroute descent as the copilot finally got through to metro. No better news unless you consider the weather at the civilian airport across town down to 300 and ¾ with drizzle and fog as good news. Destination was still completely ''yuk'' with ⅛ of a mile in fog. As Charlie drove by the base on a sort of a radar vector downwind to an ILS, he commented ''I can see the VASI's from here; we'll shoot one and if we can't get in, we'll go across town.'' No comment!

Turned two corners, ran the checklists, checked FAF and started down the glideslope. When the landing light was turned on, it looked like the inside of a pillow. Altitudes were called by the co and Charlie's last shot at life-saving judgment came at the words ''minimums—GO AROUND.'' Charlie mumbled something like ''I've got the field'' and let the machine settle deeper into the murk.

There was no fire. Actually, there was very little noise and it took a few moments for the tower to realize what had happened and hit the crash net. The visibility was so bad that all of the crash vehicles had to creep out to the site. They found a mangled, inverted T-39 lying in the muddy infield between the runway and the parallel.

The passengers all survived with minor cuts and bruises. The crew, unfortunately, was not so lucky. As Charlie let the airplane sink into the fog, he was so intent in looking for the runway that he drifted to the left. The left wing caught the empty RSU shack, the aircraft cartwheeled and tumbled through a chain link fence into an antenna structure. Part of the structure entered the cockpit and took the lives of both crewmembers.

The mishap board found the inop attitude indicator and listed that as a theorized ''cause.'' The pilot should have . . . The copilot could have . . . The crew wouldn't. . . The cause was actually that the ''can do attitude'' out-voted the ''should do judgment.'' ■



DOWN & OUT

■ During a service mission to transport two passengers to a tactical field site, the pilot of an OH-58 began a circling approach as he reached the landing area. He then made his final approach with the aircraft oriented into a 10- to 15-knot wind. About 15 feet AGL, he suddenly decided to change his heading so as to land near a parked AH-1. He applied right pedal and a slight amount of right cyclic, turning the aircraft approximately 140 degrees to the right while maintaining 3 to 5 knots of forward groundspeed. With the aircraft in a downwind position, the pilot noted he had to apply a slight amount of aft cyclic to prevent a nose-low attitude. He also noted the aircraft was descending. Although he applied 95 to 100 percent power to check the descent, the aircraft continued its downward movement until it finally hit the ground.

In the pilot's words: ". . . Out of nowhere, we lost all sorts of lift. I didn't think we could lose that much lift. I immediately applied power and aft cyclic as the aircraft began to settle. The rate of descent kept on increasing as I continued to pull in power in an attempt to cushion the landing. We had a little forward airspeed as we hit the ground . . . we hit the ground hard.

"I believe the power I had pulled in earlier had just begun to take effect because we came back off the ground . . . the aircraft began a very slow, gentle clockwise turn. I thought it was the wind. I was not very concerned at that time. I was in the process of adding forward cyclic to stop the aircraft's slight rearward drift. The left rear skid dug into the ground and we rocked back and to the left . . . the aircraft hit again,

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DOWN & OUT continued

and I believe that is when the tail rotor separated from the aircraft because at that point we started spinning. We were spinning just above the ground. The spin was very rapid. I can't tell how many times we went around. At least twice, if not more. I put the collective down and the aircraft came back down to the ground and to a halt . . . I cut the fuel off and turned the battery off. All three of us then exited the aircraft."

Although no injuries resulted from this mishap, the cost to repair the damaged aircraft exceeded $11,000. And the cause? Settling with power. As one investigator more precisely stated it: "The pilot, while executing a terrain flight approach to a tactical field site, exercised poor judgment by abruptly applying right pedal and the right cyclic at an altitude of 15 feet AGL, contrary to the guidance provided in the operators manual, and the Aircrew Training Manual. The abrupt 140-degree right turn, with little or no forward speed, placed the aircraft into an approximate 10-knot downwind condition. This improper flight control input resulted in the aircraft settling with power. The pilot was unable to stop the descent, and the aircraft landed hard."

Nothing New

Settling with power is not a new expression. Yet, sometimes "true" settling with power is confused with other conditions that mimic it. Basically, for a helicopter to settle with power, the following three conditions must be present simultaneously: The airspeed must be less than 12 knots, at least 20 percent power must be applied, and the rate of descent must reach or exceed 300 to 400 fpm.

As a refresher, take a look at the figures that illustrate the types of vortex systems present during the different conditions of zero airspeed climb, hover, settling with power, and autorotation.

During a climb, air flows downward through the rotor. Although three distinct vortex systems exist in the wake of any propeller or rotor, the system can be simply depicted as shown in figure 1.

When the helicopter is hovered, the airflow is still downward through the rotor system. However, this air picked up from a lower level, as shown in figure 2.

When a helicopter settles with power, the usual vortex systems a altered, and a separate one emerg It lies in the plane of the rotor and a continually recirculating one. Th condition, commonly referred to a the vortex ring state, can cause severe turbulence. It is depicted i figure 3.

The final situation occurs durin autorotation, also referred to as th windmill brake state. During desc of the aircraft, the airflow is upwa through the rotor system as shown figure 4.

A look at some examples of mishaps commonly (but erroneous

Figure 1

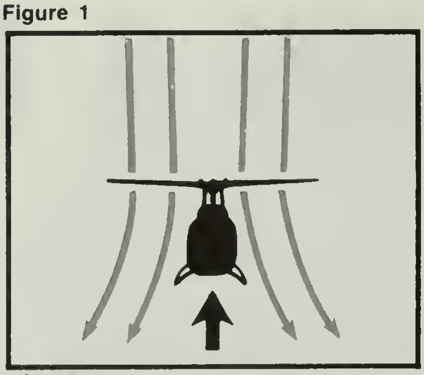


Figure 2

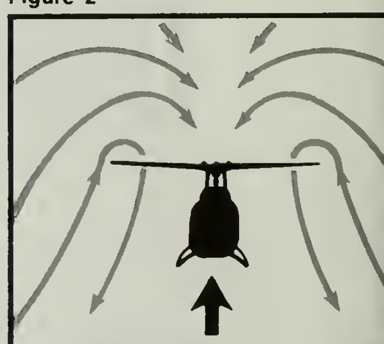


Figure 3

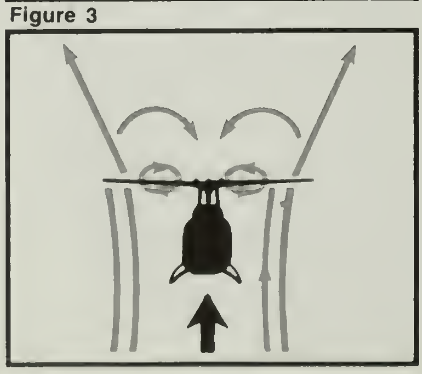
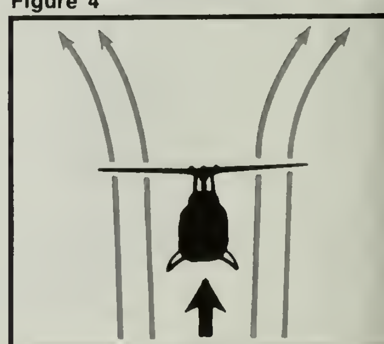


Figure 4



attributed to settling with power can help you to better understand this phenomenon so that you can avoid it.

First, consider a helicopter that takes off into a 20-knot headwind on the lee side of a slope. After reaching an altitude of 50 to 75 feet and attaining an airspeed of about 50 knots, the pilot begins a 180-degree turn. As he completes the turn, the aircraft begins to lose altitude. The pilot reduces airspeed and applies full power, but the aircraft continues to lose altitude until it finally crashes.

In this example, the pilot made a sharp turn in a known downdraft area. During a turn, more lift is needed to maintain altitude. This can be done either by sacrificing airspeed or by increasing pitch. The pilot tried both but was unsuccessful— because he was operating in a downdraft. Consequently, poor judgment can be blamed for this mishap. The pilot should have reached a safe altitude and built up sufficient airspeed while operating in a known region of a downdraft before attempting a turn. This was not a true case of an aircraft settling with power.

In a second example, we find a pilot performing a test flight to check the effectiveness of the tail rotor. The pilot zeroes the airspeed and enters autorotation at 1,000 feet above the airfield while headed into a 15-knot wind. He then elects to make a series of small turns while traveling backwards over the ground instead of making 360-degree turns. At 400 to 500 feet AGL, he senses he is falling too fast and he applies power. At about 150 feet AGL, he starts to apply pitch. When the aircraft is about 25 feet above the ground, the pilot notes the rate of descent is excessive, and he applies full pitch and power. The aircraft crashes.

The Facts

Let's examine the facts. At an altitude of 500 feet, the rate of descent was approximately 2,400 fpm. At 150 feet, the rate was the same. This meant the aircraft would reach the ground in 4 seconds. It is doubtful if any pilot could have made a successful autorotation or power recovery under these circumstances. Beginning the maneuver at an altitude of only 1,000 feet, delaying power recovery, and failing to regain airspeed before reaching a minimum of 500 feet showed poor judgment. However, here again, the true cause was not settling with power.

But didn't the aircraft in both of these examples actually settle with power? In all probability they did shortly before they hit the ground. This is true because the three requirements for settling with power were present in both instances. However, these requirements were not evidenced until just before the aircraft hit the ground. So, settling with power was not the actual cause of these mishaps.

Finally, let's look at a third mishap. This one occurred a number of years ago and involved a Royal Australian Air Force pilot. The importance of this mishap lies in its ability to show the three conditions required for true settling with power, and how readily they can occur simultaneously during flight when pilots fail to remain consciously aware of them.

This pilot was making an approach to a pinnacle. However, this approach was steeper than he intended it to be, and he allowed his airspeed to decrease below 10 knots while the aircraft was still 30 feet in the air. At this time the aircraft began to settle to the ground, and no amount of power could stop its descent.

In this instance, two conditions conducive to settling with power were present during the first part of the approach. The rate of descent was more than 400 fpm, and more than 20 percent power was being applied. When the airspeed decreased below 10 knots, the third condition was satisfied, and the aircraft promptly settled with power.

In summation, the following is quoted from this mishap report: "The phenomenon of settling with power manifests itself under conditions applying at the time, and involves high vertical rates of descent and reduced cyclic control effectiveness. This condition is entered following a low-speed, partial-power descent where the airspeed is inadvertently zeroed.

"The characteristics of settling are very similar to the feel of stall in a conventional aircraft. The recovery procedure is also approximately the same, i. e., drop the nose and accelerate into forward flight. If this cannot be done, recovery can also be made by reducing collective pitch to a minimum, which results in considerable altitude loss."

The point is clear. Applied power, airspeed, and rate of descent are the three prime factors associated with the condition known as settling with power. Any time you let your airspeed decrease below 12 knots while you are applying 20 percent, or more, power and you allow your rate of descent to reach or exceed 300 to 400 fpm, you can expect your aircraft to settle— regardless of any remaining power you might then choose to add.

Should you find yourself in this predicament, and your altitude is insufficient for recovery, you can be sure of one thing: You are going to come down, and in all probability, your aircraft is going to be out of commission for repairs. Stay aware of the conditions that lead to settling with power, and avoid this trap. The place for your aircraft is up in the air and in commission— not down and out. —*Courtesy of U.S. Army* Flightfax, *Aug 80* ■

X-COUNTRY NOTES

By **MAJOR DAVID V. FROEHLICH**
Directorate of Aerospace Safety

■ TRENDS

MANNING — Base Ops and TA manning seem to be on the upswing. Commanders are realizing that these are two very critical areas that cannot stand short or badly inexperienced. We'll keep you posted.

TRAINING — Good news! Rex is working with the audiovisual folks on what we think will be a super addition to your 271 training program. It's planned to be an orientation/motivation film which will depict the diverse duties, roles and responsibilities of the Base Ops dispatcher. We're gearing it as a tool for getting new folks up to speed quicker. Without a tech school, all's fair!

COMMUNICATING — More folks are talking about transient services! Some are called Rex Riley committees, Transient Services Working Groups, etc. The end result is the same — interested members from all base agencies are getting together and cooperating toward better and safer transient services. The keys are a "no-threat" atmosphere and a "pull-together" attitude.

Pre-answered questions can aid in better service.

INTEREST ITEMS

PHONES — We all know the costs involved and cost-cutting in progress, but aircrews have to communicate! There has to be a provision in Base Ops *and* in the billets for crews to call out or be reliably contacted. There are ways t work the problem.

INFO — I'm not one to propose cluttering walls or bulletin boards, but there is a need for info. Postec phone numbers, operating hours, bu schedules and other *necessary* information will save a lot of counter congestion or needless distraction for billeting clerks or Base Ops dispatchers. In these day of personnel cutbacks, pre-answerec questions can aid in better service.

PREFERRED DEPARTURE ROUTES — Places with bunches of traffic usually have these. Even with a SID, an arrangement with departure and center may smooth transients filing out of your airfield Work them up and post them in the flight plan area.

CREW REST/DUTY DAY — These are the rules by which crewmembers are often governed. There are still lots of folks at bases that don't completely understand. Education is the key! Officer or enlisted, colonel captain or staff sergeant — if an individual is crewing an aircraft, he or she probably has a maximum duty day and minimum rest requirement prior to beginning the next duty day These are *rules*, not preferences, and they have a sound basis providing a

safety margin for aircraft ops. You can't have a completely smooth transient services operation at your base if some of the players don't appreciate the rules.

NEW ADDITION

Dyess AFB—Folks down Abilene way are putting out the welcome mat. TA, Ops, billets, transport and inflight all checked OK. A good place for a mid-U.S. fuel stop or an RON when you travel the southern route.

REEVALUATIONS

Elmendorf AFB—Once again, we received an outstanding report on this up-north place. The key word that kept showing up was attitude. They get a good load of transient traffic and all concerned display an obvious attitude of helpful and courteous service. Good work!

An otherwise excellent operation (may) be dragged down by one gross area.

Kadena AB—Had some problems in the past, but we got good words about them on the most recent reports. Some strange airfield, weather and location problems, so study up if it's your first time in.

NO CIGAR

BASE X—Generally a good report except the TA area. Only 9-10 folks on board to work a high count overseas, 24-hour TA section. At times dangerous!

BASE Y—This location had plenty of help but shoddy. The TA folks were all over, but lackadaisical. Procedures were careless, safety precautions non-existent, and service matched all of the above.

BASE Z—Broke my heart! Flightline operations were outstanding. Transport and food facilities excellent. Billeting was the bust! Officer quarters acceptable, but nothing to write home about, but the quarters that the enlisted crew folks were assigned were the "pits." Mosquitoes breeding, roaches marching, and facilities falling apart. A shame to see an otherwise excellent operation be dragged down by one gross area and apparently one individual who doesn't care!

PLEASE WRITE! We keep files on every base in the world. We often forward correspondence to installation/unit commanders and receive positive feedback. Our mail to "Dear Rex" is increasing, and we're happy that we are a sounding board for crews, managers and anyone with the desire to improve transient services. Better communication leads to better cooperation leads to better and safer transient aircraft operations. Write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

THE

REX RILEY Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso, FL
DOBBINS AFB	Marietta, GA
RAF BENTWATERS	UK
RAF UPPER HEYFORD	UK
ANDERSEN AFB	Guam
HOLLOMAN AFB	Alamogordo, NM
DYESS AFB	Abilene, TX

SURVIVAL: Thinking Cool

By MSgt DONALD R. McLAUGHLIN | Current Operations Division
3636th Combat Crew Training Wing (ATC)
Fairchild AFB, WA

■ With the forthcoming winter pressing at our backs, let's turn our attention to the mental and physical preparations that one must make to ensure a safe and healthy return should an emergency arise. Military aircrew personnel are faced with the fact that mechanical failure, human error, weather, and, because you are in the armed forces, battle damage may render your aircraft unsafe for human occupancy. Since that only happens to others, many of us unconsciously drift into a state of complacency and become unprepared for an arctic survival episode. Don't be a Johnny-come-lately! Use the information discussed in this article to increase your survivability in the event you become the victim of an aircraft emergency.

Often, when involved in a discussion on arctic survival, we tend to limit the conversation to the geographical boundaries that encompass the North and South poles. To establish a practical extreme cold survival plan you must also include areas of high altitude where arctic-like conditions may also occur at any time of the year. Weather in extreme cold areas is unpredictable and can change so rapidly that all attempts of the *unprepared survivor* may be of no avail. The long periods of darkness during the winter months and subzero temperatures require the survivor to be totally familiar with issued life support equipment and well versed in such skills as shelter construction and firecraft.

Personal Protection

Personal protection, from a survival standpoint, might best be defined as those preventive measures taken to preclude both physiological and psychological injury or harm. A most important step toward cold weather survival is *maintaining body temperature*! Personal protection in arctic or arctic-like environments may be more difficult than in other areas of the world due to the extreme harshness of the conditions to which the survivor may be exposed. But, it is *not* an impossible task.

The tools for survival are furnished by the Air Force, by you, and by the environment. Survival training has provided you the sk and techniques. But tools and training are not enough; neither effective without the will to survi When you find yourself faced wit survival situation, remember this The mental barriers to be bridge may be far greater than the obstac presented by the natural environment. Emphasis should b placed on a healthy attitude; alw be alert to complacency creeping to control your actions and emotions, either before or during survival episode. Get to know y capabilities and tolerance levels. following are nine survival stress that you may be faced with: (1) F and anxiety; (2) Pain, injury, an illness; (3) Cold and hypothermi (4) Thirst; (5) Hunger; (6) Fatig (7) Sleep deprivation; (8) Depression, feeling sorry for yourself and boredom; (9) Loneliness and isolation.

Cold Injuries

The prevention and early detect of injuries associated with arctic conditions cannot be overemphasized. In severe cold

climates, if injuries such as bleeding, burns, and fractures are incurred, the treatment necessarily becomes twofold. Not only do you have to stop the bleeding or splint the fractured limb, but you must also guard against frostbite by adding insulating material to the injured member.

Hypothermia is a common medical problem. It is also prevalent during milder temperatures, especially if dampness is present. Hypothermia results when the body's core temperature is lowered due to an inability to produce enough heat to keep up with losses which occur through radiation, evaporation, conduction, convection, and respiration. To prevent hypothermia you should eat, drink warm fluids, take frequent rest breaks, stay dry, and regulate your body temperature through proper utilization of clothing and shelter.

Frostbite is the freezing of body tissue and fluids. You may suffer superficial frostbite (the skin only) or deep frostbite (that which may penetrate as far as the bone marrow and includes all tissue to whatever depth the frostbite reaches). Except in rare cases, frostbite is restricted either to the extremities of the body (hands, feet, nose, and ears) or to areas like the heels, chin, and cheeks. The severity of the injury is influenced by the intensity of the initial exposure and length of time before adequate circulation can be restored. Frostbite is prevented by wearing protective clothing and by not allowing flesh to become exposed to cold and wind, or come in contact with cold objects like wood, fluid and metal. If flesh does freeze, do not rub, massage, or open blisters. Do not rewarm using the flame of a fire. If superficial frostbite is the case, rewarm immediately using body heat. Deep frostbite should not be rewarmed when it is not known how long it will be before receiving clinical treatment.

It is good practice to enroll in a first aid course with emphasis on self-aid. After all, a lone survivor must also be the doctor.

Clothing

Clothing is the first line of defense against any environment in which you may find yourself. In order to prevent such cold injuries as hypothermia and frostbite we must know how clothing keeps us warm. The degree of warmth that clothing provides is determined by the amount of insulation. Insulation in clothing is nothing more than dry, dead air held in between the fibers and the layers of clothing.

Both natural and synthetic materials used in clothing for insulation must be able to breathe so as not to cause condensation on the inside of the garment.

An acronym of the word COLD can help you to remember how to use and care for your clothing.

Keep it **C**lean
Avoid **O**verheating
Loose and in Layers
Keep it **D**ry

You must keep it clean to prevent the entry of dirt particles into the fabric, which through friction would wear holes in the garment. Dirt also clogs the air spaces and causes heat to be lost by conduction. By ventilating when warm and slowing down your rate of work, you can avoid overheating which causes the clothing to become wet from sweat.

Remember heat is lost nearly 200 times faster through wet clothing than through dry clothing.

Multiple thin layers of clothing will be more effective in keeping your body temperature at a constant level than a couple of very thick layers. This will also allow you to add or remove layers as you get warm or cool off and not cause you to dampen the thick layers from sweat caused by wearing too much clothing for your activity.

The layer system is a very personal thing that must be experimented with by YOU to see what keeps you warm. Your ability to use clothing properly may make the difference whether you live or die.

Remember if you take care of your clothing and equipment it will take care of you when you need it.

Fire

Many people have suffered unnecessarily, and in some cases died, because they waited too long before attempting to build a fire. (Read Jack London's short story—To Build a Fire.) As a result, their fingers lost the dexterity necessary to hold matches, flint and steel, or other fire starting devices. DON'T WAIT! As soon as you recognize the need for a fire, get busy gathering the necessary materials.

Within the tree line, fuels for fire are plentiful. Bark from birch trees, found throughout the northern regions of the world, is one of the best tinders for starting fires. Highly flammable and easy to procure, it provides the foundation upon which to build. The lower dead limbs from spruce, the predominant evergreen in the North, provides the kindling. This abundant source of dry wood may be gathered by the arm load; it ignites easily, producing both heat and light. Dead standing birch and aspen trees are also sources of fuel. Often these may be pushed over and brought into camp in large pieces. Chopping and sawing expend large quantities of energy and produce wasted body heat and excessive sweat. In the treeless regions of the arctic, scrub willow and drift wood may be your only sources of wood.

While survival manuals and

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schools historically have advocated the use of primitive fire starting devices, i.e., flint and steel, *nothing beats a match* for getting fire going quickly. M-2 Firestarters contained in some survival kits are another excellent fire starting aid. Metal matches, magnesium fire starting tools, and flint and steel are also effective, but require a higher degree of skill to use and allow less time for practice under cold conditions.

In order for a fire to burn efficiently three things are necessary:

Heat—initially that heat produced by fire producing device.
Oxygen—from the air.
Fuel—from natural resources, POL products, etc.

Remove any one element and you will be without a fire.

Start with thin, fine dry materials such as: shredded birch bark, dry moss, or wood shavings.

Increase size of wood gradually, allowing each successive layer to ignite before adding another.

Maintain adequate ventilation. Don't compact the layers of wood and smother the fire.

Warmth, light, drying clothing and equipment, melting snow and ice for water, cooking food, signaling, and morale are all dependent, to a degree, upon your ability to produce and maintain a fire.

This is only a guide to firecraft. "Hands-on" practice is the only way to develop the necessary skills to ensure your ability to maintain your body heat through the use of survival fires.

Shelters

Shelters for the arctic are designed to afford effective maintenance of one's body temperature from a minimum amount of expended energy. Careful shelter site selection, available materials, and the proper shelter for the type of weather are the three factors a survivor should consider.

In selecting an area to construct a shelter it is necessary for one to consider safety as well as individual needs. Natural hazards such as avalanches, high winds, water fluctuations, and dead standing timber are just a few dangers that may be encountered. The survivor should also, at the same time, evaluate other basic survival needs. These needs consist of food, water, fuel, adequate signaling area, and building materials. With personal safety and these needs satisfied, the survivor is ready to begin the construction of a shelter.

Arctic shelter construction is based on the thermal principle. There are two basic concepts of this principle. First, the use of the insulation quality of dry snow derived from the mass of dry, dead airspace enclosed between individual crystals. Second, the use of heat radiating from the earth when bare ground is exposed inside the shelter. With those principles in mind it is possible for a survivor to construct a shelter that will maintain a constant temperature of plus 10 to 20 degrees Fahrenheit inside even though the outside air temperature is below zero.

Shelters are divided into those constructed within the tree line and those constructed on barren land to include the ice pack. The primary difference is that of building materials. Tree line shelters are constructed of pole frameworks and covered with boughs and snow. A few examples are the Thermal A-Frame, Thermal Wedge, and the Thermal Double Lean-To's. Barren land shelters are constructed of blocks cut from compact snow. Some examples of these shelters are the Fighter Trench and Para Snow House; a snow cave may also be dug in a snow drift.

It is important that all shelters b kept large enough to provide room for the survivor and equipment, ye not so large that it is difficult to heat. The entrance to all shelters should be completely sealed from the outside environment. A ventilation hole is necessary if a he producing device such as a small stove is used in the shelters.

Water and Food

You need as much and sometim more water to survive in the arctic than in a summer desert. Each day about one pint of water is lost through respiration, about one pint through perspiration and about two quarts through evacuation. A 2½% loss of body fluids without replacement results in up to a 25% loss of efficiency in working and thinking. A 10% loss of fluid usually results in death. A three quart loss per day, replenished by two quarts per day, results in a 10% loss in about five days. You must continually ensure that you drink three to four quarts of *warm* fluid each day to maintain your body flui level and prevent dehydration. To maintain your body temperature in cold environments it is necessary t maintain an intake of energy producing foods. Daily caloric requirements increase from 3,500-4,000 calories to 4,500-5,00 calories per day. Once signals are constructed, firewood gathered, an you are safely sheltered, the daily caloric requirement decreases. During the first 12 to 24 hours of survival episode, calories are provided by the meal eaten just before or during the flight. After that, one must fall back on surviv rations and food procured from the land. A survivor's diet should

consist of a high percentage of carbohydrates (General Purpose Rations — 870 calories per can) during the first few days thereby allowing the body to adjust gradually to burning larger proportions of fats and proteins.

Rescue and Survivor Responsibilities

The most important member of a recovery force may well be the survivor. Rescue doesn't just happen . . . it is made to happen by YOU, the survivor! By applying the basic fundamentals already discussed in this article, you will be alive to be rescued.

Virtually anyone and everyone is a source of rescue. Don't hesitate to attract the attention of anyone that is in or near your area. It is the survivor's responsibility to initiate contact with recovery forces. As soon as there is an emergency, transmit your distress call to anyone that will listen to you. If possible, let them know who you are, where you are, altitude, heading, and your full intentions. Do this while still in the aircraft. Transmit in the blind if contact cannot be made. Don't wait until you are on the ground relying on emergency transmitters which have limited range and battery life; especially with extreme cold conditions where the batteries may only last a few minutes.

Once on the ground, turn off all activated locator beacons to prevent the continuous tone from overriding all voice communications. Immediately establish a logical sequence of transmissions to effect voice contact. Conserve the battery life of the transceiver by using a Beeper-Talk-Listen-Cycle. To accomplish this transmit a continuous tone for 15 seconds, transmit your call sign two or three times, and then monitor 15 seconds listening for a reply. Repeat this cycle three times consecutively. If a reply is not received, turn off the transceiver and wait until such time as you feel someone will be within transmission range. Caution: When the transceiver is not in use, place it between layers of clothing to protect the battery from the cold. While waiting for rescue, mentally practice the vectoring technique in the event you are required to direct the recovery forces to your position.

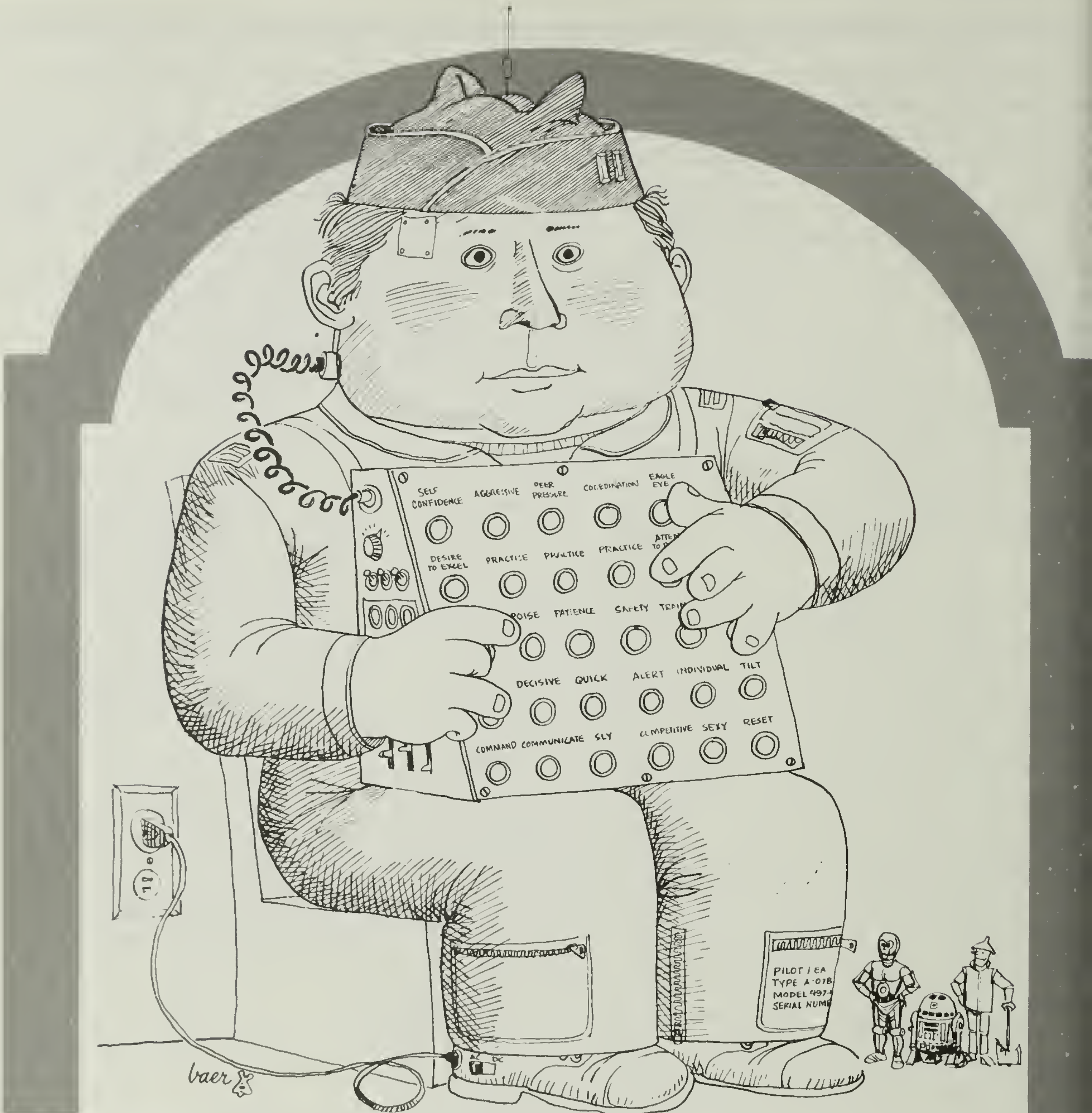
Don't lose confidence in the rescue forces and attempt to walk out. Travel in the arctic is not recommended under most circumstances. The hazards and difficulties which may be encountered far outweigh the advantages of trying to return to civilization under your own power. The only reason you should travel is to locate a safer position or one providing more resources and then, only for short distances. A short distance for a survivor may be as little as 15 minutes walking time.

Use visual signals to enhance your chance of being spotted. An aircraft kept clear of snow serves as a ready made signal. Strip signals constructed from commercial or natural materials are designed to attract attention and carry a message. To be effective, a strip signal should be placed so it can be seen from 360 degrees by search aircraft and visible as far away as the naked eye can see. It should contrast against its background and have distinct, straight lines and sharp corners. The absolute minimum size for a strip signal is 18 feet long and 3 feet wide, and should be larger if it is to be seen from any distance. Snow signals can be stamped in the surface using proportionately larger dimensions. Be careful, this activity expends energy.

The arctic winter has many days with long hours of darkness and, therefore, some type of signal light will be highly beneficial, i.e., fire, flashlight, gyro-jet, MK-13 day/night flare, strobe light. All of these should be ready for use at a moment's notice and, except for fire, activated only when you are certain the search party can see the signal or upon request of the SAR personnel.

In order for the rescue forces to continue with a high rate of success in recovering downed aircrew members, the survivor must be trained, equipped, and prepared to accomplish the various tasks required to preclude being a liability rather than an asset. In the final analysis, mental attitude can determine the success or failure of a survival ordeal.

Questions or comments concerning the information contained in this article should be addressed to:
3636 CCTW
Current Operations Division (DOO)
Fairchild AFB, WA 99011
or AUTOVON 352-2339. ■



By CAPTAIN GORDON N. GOLDEN · Directorate of Aerospace Safety

■ There are times in our lives when perceived role and peer pressure become so strong that we are not able to objectively view our own actions and their impending results.

Somewhere, some time ago, maybe it was in Introduction to Sociology, I heard it said "The way we think and act is the result of the sum total of our experiences and our environment." Personally, I think we are not puppets of our environment. However, when you step back and look around, maybe there is some truth to the "product of our environment" theory.

An observation was made several years ago in the civilian community about the number of flying physicians involved in light aircraft mishaps. It seems that doctors as a group were involved in light aircraft mishaps way out of proportion to their numbers. The analysis finally centered on the doctors' perceived role. They could *never* be wrong. In a doctor's daily dealings involving life and death decisions, if he ever started to doubt that the actions he took were right, his psyche would not survive, the pressure and self-doubt would be too great. Therefore all doubt about his professional actions was eliminated for survival.

This defense mechanism became part of the individual's personality and was integrated into all of his thought processes. This "I can't be wrong" defense mechanism translated into aircraft mishaps usually as a corollary to the "get-home-itis" syndrome. Once the

Why Do I Do The Things I Do?

decision to fly to a destination was made, the pilot physician would press on despite deteriorating weather which was the usual scenario of a mishap. You see, once he had made the decision to go, he had to continue; it was part of his role.

''Well, that's a great piece of information,'' you say, ''but how does that apply to me?'' Macho Man has been a part of the pilot's image from the beginning of aviation. The word ''pilot,'' especially if prefaced by ''fighter,'' instantly conjures up the picture of a daring young man and his flying machine with his scarf trailing in the breeze. The image literally oozes danger, excitement, and adventure. It's part of the role we play as pilots.

A pilot has to have self confidence and a certain degree of aggressiveness or he won't make it as a pilot. The I'm-the-best-aviator-who-ever-raised-a--gear-handle attitude helps us maintain our individuality and makes us think for ourselves to a certain degree. That's one part of the environment we move in as Air Force pilots, the superior skill and cunning pilot role we all emulate.

Another part of our environment is peer pressure. Peer pressure is something we have all experienced in varying intensities throughout our lives. We usually conform to the group norms if we want to be accepted by the group. New pilots in a fighter squadron probably experience one of the more intense peer ''pressure-cookers'' that our society has developed.

A new fighter pilot (low time in that particular aircraft) comes into a squadron able to safely fly the aircraft and basically qualified to perform the mission, yet not long after this ''new guy'' arrives at the unit he discovers he will have to prove himself before he will be accepted into that particular group of the brotherhood of fighter pilots. Nobody, even a new guy who has not had time to gain proficiency, wants to be labeled the squadron ''grape'' or be a long-time resident of the bottom slot in the top gun competition.

The stage is now set. We have a fighter pilot with a strong self-image (possibly stronger than his abilities warrant) who is sorely tempted to press his self-established limits to gain the admiration of his squadron mates or avoid humiliation at their hands.

There's no problem with striving to improve ourselves, but when there is a mismatch between our perceived limits and our actual abilities, look out!

Take a look at a few indicators of this mismatch between perceptions and abilities. Some have figured in lost aerospace hardware and pilots.

Have you ever seen the pilot who:

- Won't knock off an ACT engagement, no matter what, until he gets a shot?
- Will do *anything* to keep from getting shot in an ACT engagement?
- Overshoots half his rejoins after takeoff trying to set a new squadron record?
- Consistently fouls on strafe passes?
- Charges the refueling boom to the point that the boomer gets jumpy?
- Continues the low level mission in deteriorating weather?
- Tries to salvage a poor roll in on a bomb pass?
- Takes a broken airplane for fear of being called a weenie?
- Calls ''Judy'' on a low, slow target with the gear horn blowing in the background?
- Flies an alternate mission when he's not really prepared?

Did you see anybody you know? Did you see yourself? We're all responsible for the problem:

- The new guy who's pressing his limits.
- The IP or flight commander who sees a gap between a pilot's abilities and his actions and doesn't say anything about it.
- The training officer who throws everybody into the top gun competition as soon as they walk through the door.
- All the guys in the squadron who ping on the new pilot every time he makes a false move.

Training for a tactical mission is by nature competitive, but the emphasis has to be put on increasing unit combat effectiveness, not personal prowess. If we can switch emphasis to the unit as a whole and help the new guy get up to speed instead of putting him through a trial by fire, maybe we can reduce some of our over-commitment losses. ■

Hydroplaning Made Easy

By MAJOR ARTHUR P. MEIKEL
Directorate of Aerospace Safety

■ Hydroplaning is easy. All you have to do is land an aircraft on a wet or icy runway and you will experience some sort of hydroplaning.

In reviewing past hydroplaning articles we find that the same information is often presented in slightly different format. The pictures and examples change, but the definitions and explanations are consistent and correct.

With all of this good information readily available, why is it that our aircraft keep leaving the runways at other than designated taxiways? To make better use of the information we have received over the years let's think of it in two categories: (1) How to stay out of a moderate or severe hydroplaning situation and (2) What to do when confronted by hydroplaning conditions.

The first category of information can better be described as education, facts, formulas and figures designed to teach JUDGMENT. Authors are reluctant to mention judgment for some reason, but a major portion of a pilot's pay is earned through the decisions he makes. If you are willing to make the decision to divert to an alternate, you may have selected the best defense against a hydroplaning mishap. Notice the phrase "willing to make the decision to divert." When an aviator is designated pilot in command, he is recognized as "able and responsible" to make a decision to divert. Idealistically, the decision is the pilot's; however, anyone who flies knows the pressure to stay on schedule or get the passengers/goods to their destination. To help us make a sound decision on whether or not to land, let's review what information is available from preflight through just prior to landing. Consider which information is most critical. As you scan the list, try to rank them according to what value you place on each item and how much it affects your judgment.

- **Coefficient of Friction (M=F/N)**
- **Definitions of Viscous, Reverted Rubber and Dynamic Hydroplaning.**
- **Tire Pressure (7.7 $\times \sqrt{p}$).**
- **RCR**
- **Runway Composition/Surface.**
- **Tire Condition.**
- **Current Weather Conditions.**
- **Consult with Supervisor.**
- **Aircraft Capabilities.**
- **Your Proficiency.**
- **Runway Environment.**

Coefficient of Friction The formula M=F/N for coefficient of friction gives you an abstract figure based upon friction force over normal force. This formula is nice to know but is unimportant if you already believe that braking effectiveness is a variable which is dependent upon, among other things, the runway surface condition. In other words, if you believe "it gets slippery when wet," you have learned this lesson.

Definitions The definitions of three recognized types of hydroplaning are meant to teach you that hydroplaning of some sort can occur from touchdown to O KIAS with very little moisture present or on a patchy runway.

Reverted rubber hydroplaning occurs when the pilot locks the brakes. During a prolonged skid, the tire slides on a layer of melted rubber or steam generated by friction on a wet surface.

Viscous hydroplaning occurs on wet runways with a smooth surface or one covered with melting ice or rubber deposits. During viscous hydroplaning a tire displaces only a portion of the moisture on the runway surface.

Dynamic hydroplaning occurs when an aircraft tire is completely separated from the runway by water. Dynamic hydroplaning is affected by the ability of the tire to break through the layer of water.

Tire Pressure ($7.7\times\sqrt{p}$) An Aircraft will continue to experience dynamic hydroplaning until it decelerates to a speed below $7.7\times\sqrt{p}$ (P equals tire pressure). During landing this is a good figure to be aware of so you will know at what speed you should begin to get improved braking effectiveness. Below this speed you still are susceptible to viscous and reverted rubber hydroplaning. For large aircraft, tire pressures are varied for different gross weights. Ask your crew chief the tire pressure on preflight. It is normally on his preflight checklist.

Tire Condition Tread patterns greatly affect the tires' ability to break through a limited amount of surface water. If you are flying with a set of "slicks," you are in much worse shape than if you have a good set of water diverting, deep grooved tires. Maintenance can prove that your "slicks" are good for at least two more landings. As aircraft commander, it is your prerogative to decide if they are acceptable for *your* next two landings. Change if necessary!

Runway Composition/Surface Another good mission planning task would be to investigate the runway composition and type of surface for your base of intended landing and your alternate. A concrete runway is more desirable than an asphalt one when you are trying to avoid viscous hydroplaning. In addition to determining the runway composition, the type of runway surface is also important. If a runway is grooved, it helps water escape from under the tire and prevent dynamic hydroplaning. It would also be good to know the drainage situation at your base of intended landing. Some bases near sea level have poor drainage and literally are underwater during a moderate rain. Other bases have porous runways and water disappears instantly. If this information is not available, or you lack personal knowledge, call the base operations officer or talk to someone who has operated out of the base. Unfortunately, this information isn't always available in the IFR Supplement.

Aircraft Capabilities Review your dash one, if you haven't done it lately, to refresh yourself on winter operations. Include crosswind limitations on an ice-covered runway. Aircraft capabilities include becoming intimately familiar with your antiskid system, braking system and a review of winter thrust reverse procedures.

Runway Environment Review your destination's environment with hydroplaning factors in mind. In addition to checking runway length, check to see if there is an overrun. Many civilian fields or combination civil/military fields don't have an overrun. Some flight manuals make special provisions for landing on runways without overruns. If the field services primarily airliners, expect that snow removal may not be as good as you are used to since most commercial aircraft are blessed with thrust reversers. Look at the runway gradient. If you have your choice due to a crosswind or very light wind, landing uphill may make a 500′ difference. Know the size of the "zero zone" (distance from the end to the first marker) at your destination. When you are hydroplaning past runway markers, it may help you to know *exactly* how much runway you have remaining, i.e., 6,000′ or 6,400′.

Consult with Supervisor After you've done all of your homework and are ready to go fly in less than optimum conditions, let your supervisor know what the latest conditions are and tell him your intentions. You will find that he is under the same pressures that you are. He also has to accomplish a mission and keep his aircraft in one piece. Get the benefit of his experience. A topnotch supervisor will let you know what he expects and remove any self-induced ☞

Hydroplaning Made Easy continued

pressure you might feel. Besides, he is getting paid to make decisions, too.

Your Proficiency Consider your capabilities as well as your aircraft's. If you have been filling the minimum number of squares in the last few months due to leave, DNIF or alert you may be putting yourself behind the power curve. I have seen pilots request that an IP be added to the flight orders due to forecast weather conditions. The request was honored and was considered by all to be good judgment.

Current Weather Conditions Right up to the time of landing, the weather must be monitored. A heavy shower over the runway while you are on final approach could cause you to delay your landing until the shower passes. Frontal passage may mean a big change in winds in a short time. A severe shower or abrupt wind change can quickly put you outside your aircraft limitations or remove the headwind advantage you might have counted upon.

RCR Runway Condition Readings give you a good estimate of what kind of braking action to expect. If you find yourself in a position where stopping distance is critical, request more information on the reading before putting a lot of confidence in it. How old is the reading? Was it taken right behind a snowplow? What is the RCR in your specific stopping zone? Has precipitation fallen since the last reading? The point is, don't rely on the accuracy of an artificial RCR value except for a planning factor. If you don't get the braking action you expected, go around.

Now that you have gathered the necessary information and if you made the decision to land, you are about to enter phase two. Let's consider what things you have to work with between the final approach fix and a full stop. Make a mental priority listing of the most important factors to you and your aircraft.

- **Reconsider**
- **Go-Around**
- **Firm Landing**
- **Aerodynamic Braking**
- **Braking Technique**
- **Which side of runway to land on**
- **Directional Control**
- **Landing Speed**
- **Asymmetric Thrust**
- **Differential braking**

Go Around I like the decision to go around the best. You can't go off the end of the runway if you still have the ability to take off. You may find that the information on which you based your decision to land was incorrect. The RCR you were given may have been incorrect or old. Water may have turned to ice. Precipitation could have increased while you were on final. You might have bounced on touchdown or been fast on final. All sorts of things could have gone wrong, gone wrong, gone wrong! Of course, the go-around must be done smoothly, correctly and in time. This requires some planning and coordination on your part. You ha to convert the decision time, communication time, engine acceleration time, takeoff distance rotation distance and obstacle clearance distance into a meaningf distance and speed. Planning can shorten decision and communicati time but the other factors are pret much constant. Your flight manua can provide you with some of the figures but you must decide how slow you can go at your weight a still take off. (For example: at 12 knots you may need 2,000′, at 10 knots you may need 3,000′, at 7 knots you may need 4,000!)

Reconsider After one attempt, you may find that you have bette information to make a decision. C back to step one even if it was on your proficiency that wasn't up to par.

Landing Speed Increases in landing speeds add distance to yo ground roll and flare distances. Whether extra speed is due to pil deviation, turbulence, configuratio or gusts, the extra ground roll required to dissipate your ground speed may exceed runway availab If stopping distance is critical, a around due to excessive speed ma be required.

Firm Landing Previous articles state that a firm landing can dissipate from 10 to 15 knots. If y are above your computed speed, a firm landing can result in a boun and more runway behind you tha you would like.

Braking Technique There are

two major points to consider. The first point is when to start braking. ASAP is about right. Don't use any delayed braking factor or wait until your normal braking point. If the runway is damp or partially snow covered, or otherwise doubtful, stop the machine as soon as you can. It is safer and will provide you with a better idea of your aircraft's capabilities. The other point to remember is how your dash one recommends braking on wet or icy surfaces. In general, you want to brake as hard as you can without locking up your tires. With your wheels locked, you can hydroplane to a much lower limit of your dynamic hydroplaning envelope. Releasing brakes occasionally will release inadvertently locked tires.

Aerodynamic Braking Every airplane is capable of some aerodynamic braking. As much as possible should be used to take the maximum advantage of headwind components. Some aircraft have limitations on aerodynamic braking due to poor controllability during crosswind situations. On other aircraft, crosswinds may cause normal braking to be uneven during aerodynamic braking.

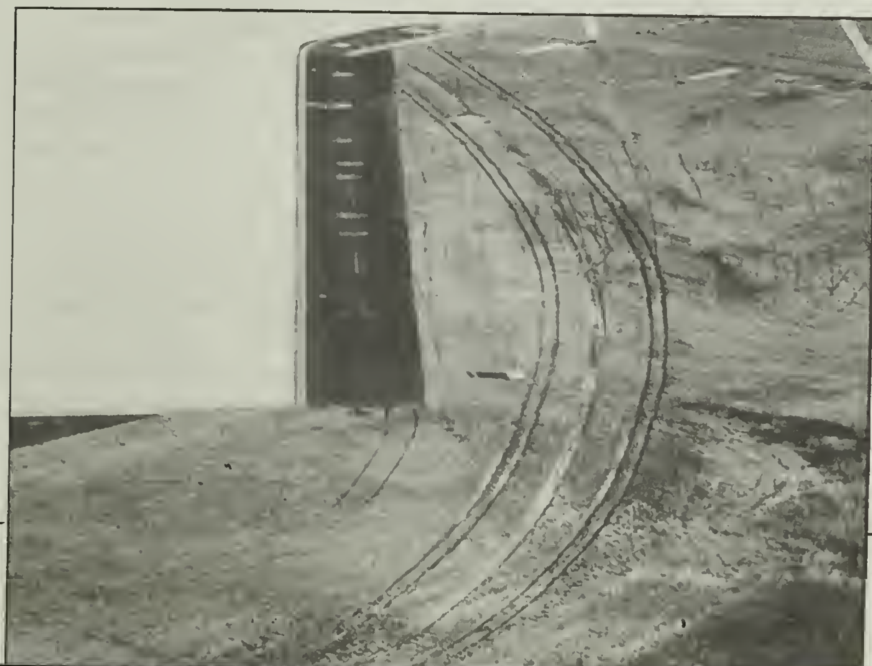
Which Side of the Runway to Land On There are a lot of factors to consider in this decision. I'll simply try to list them and let you make your own decision. Landing in the middle of a crowned runway is normally the driest spot, however, a crosswind prevents water from running off the upwind side as quickly as the downwind side. If you move slightly off center, you run the risk of putting a set of main tires on the slippery painted center line. Moving slightly farther to the downwind side puts you on a side slope and a crosswind pushing you down that slope toward the short side of the runway. If your aircraft has a drag chute, you have another force helping you toward the side. If you land on the upwind half, you face the problem of your aerospace vehicle weather-vaning into the short side of the runway. When you slow to below the dynamic hydroplaning speed, directional control becomes a consideration as the aircraft starts to gain directional capability toward the near edge of the runway. At these slower speeds aerodynamic directional control is poor. On flat runways, there also is the problem of puddles or ice patches to avoid. As we discussed earlier, the depth of the water is a definite factor. Snowplows and sweepers sometimes leave patchy intersections or portions of the runway which make normal braking uneven. If wheels are locked crossing patchy areas, reverted rubber hydroplaning can result. Dealer's choice!

Directional Control Refer to your dash one for your best means of directional control. The rudder is usually the best means of keeping the aircraft where you want it. Use ailerons to counteract crosswinds for as long as possible. Even in large aircraft, ailerons play a greater role in steering than many pilots think. Improper use of ailerons can cause uneven braking, even at slow speeds, since it places uneven weight on the main landing gear. As for nose wheel steering, it is useful mainly in clearing the active runway after the aircraft is under control.

Asymmetric Braking/Thrust

While asymmetric braking works better than nose wheel steering, in most cases the use of asymmetric thrust or braking means that you aren't using every means available to stop the aircraft. You probably planned on using all of your braking effectiveness and, at most, idle power. You are, in fact, increasing your ground roll, and possibly, should go around. Quite often asymmetric directional control occurs at relatively low speeds which are past the go-around point. One nice aspect of using asymmetric thrust is that a skidding tire won't be damaged as long as total hydroplaning occurs. The bad aspect is that you may be one hand short when looking outside the aircraft and trying to locate a throttle inside the cockpit. How proficient are most of us in taxiing an aircraft on an icy runway with throttles only? When was the last time you did it?

The next time you taxi clear of a wet or icy runway your sigh of relief will be because conditions were as you expected them to be and you knew you could stop. Gone are the days when you might have estimated and hoped that you would be able to stop. Hydroplaning is easy when you know how. ■

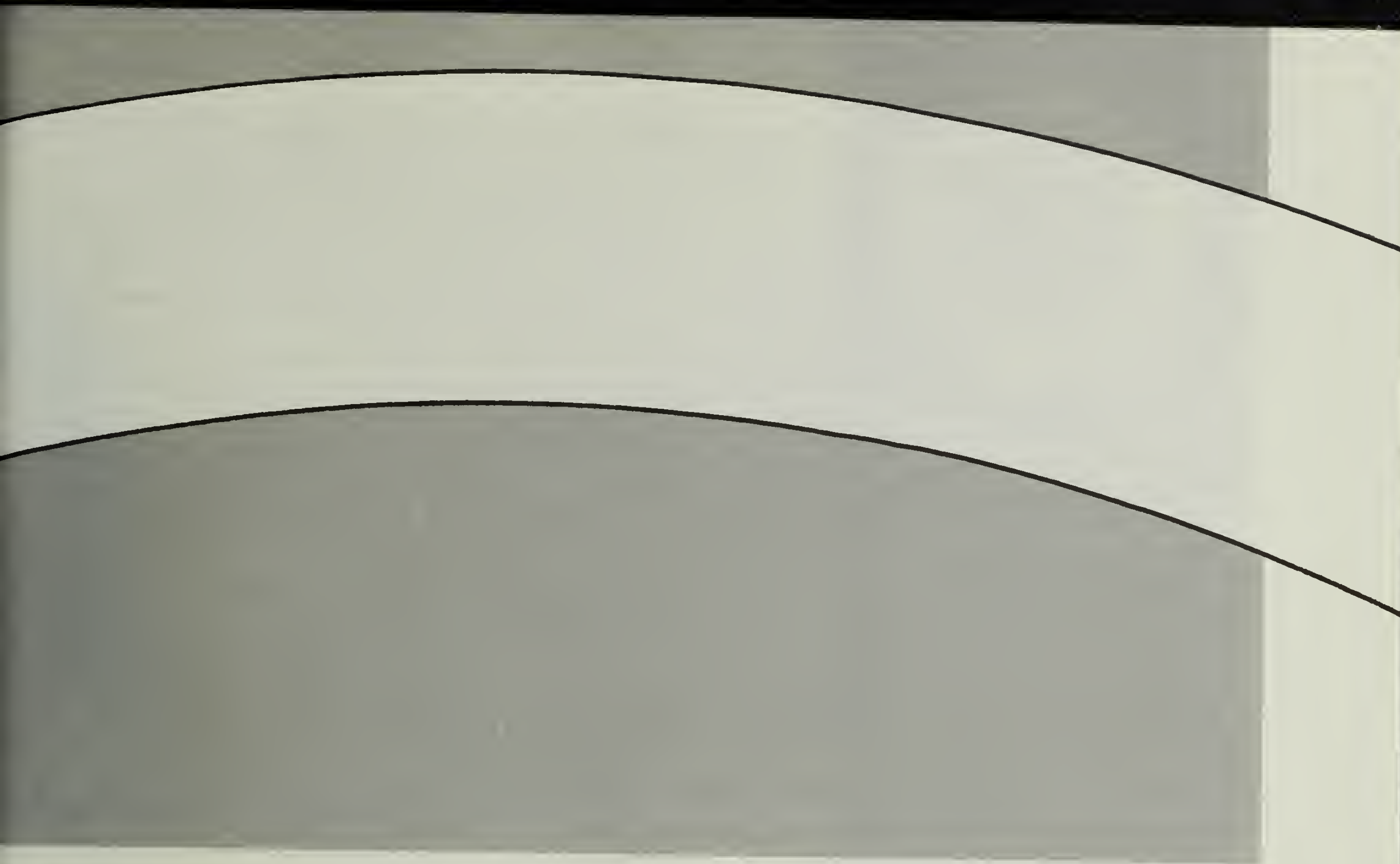


THERE I WAS

■ The range training officer had just advised me that I had killed the last of four adversary aircraft my element had engaged on a dissimilar air combat tactics mission on an air combat maneuvering instrumentation (ACMI) range. No shots had been fired by the opposition, and I was feeling rather good about how things had gone for me and my Eagle jet.

Partly out of sheer exuberance and partly for the benefit of my A-4 "partner" who had acted as a six-checker, while I worked the F-15's radar and weapons systems heavily, I figured one victory roll for each of the four kills I'd been credited with by the ACMI computer would be in order.

So, here goes . . . stick forward slightly to 1 G, or a touch less, out of the mild climb I was in, then stick smartly to the right, being careful not to go to max deflection (a dash one no-no in the Eagle if rolling more than 360°). One, two, (going almost too fast to count) . . . say, the nose is starting to move off its point, three . . . my God—I'd better knock this off . . . four . . . stick is centered laterally but the bird won't quit rolling! . . . Let's try just a touch of opposite aileron . . . No good, perhaps increase t roll rate. . . . You dummy, you m have induced an auto-roll . . . Le see—are we positive or negati G? Damn, can't tell . . . Would es mate about ½ positive G 'cause I light in the seat but not hanging the straps . . . OK, positive—h goes anti-roll rudder. . . . Jeez! Tl was obviously the wrong way. T roll rate is at least as fast as, ev seems faster (. . . must have do 8 or 9 rolls by now and the nose starting to drop below the horizo but now I'm definitely *negati* G—the shoulder straps are cutti deep and the lap belt hurts. I gu that's *good* news. No doubt in r mind *now* which rudder to use . here goes.



Pro-roll rudder . . . It's still roll-ing. I believe it's rolling faster, but I *know* I've got the correct rudder in . . . Hope it works, would sure ruin my day if it doesn't . . . OK! It's slowing down its roll rate—looks like three rolls after getting all the pro-roll rudder I could achieve . . . Oops! What was that! As the Eagle stopped its rolling it did a negative 2½ G and a positive 7.3 G ya-ha maneuver with several smaller cycles of the same porpoise—all with the stick held centered. Thank God it's over.

After looking my beast over to ensure all was well, I decided I'd probably not do that again. I distinctly recall thinking how foolish I'd feel if I had rolled that way after splashing my fourth or fifth Flogger only to leap out because I couldn't recover from a condition I had induced.

I've since talked with a senior MACAIR test pilot and a USAF "golden arm" who has flown Eagles since the early days at Edwards. Both stated they'd never been in that particular flight regime, though the MACAIR pilot stated that he was aware of a great dislike by the Eagle for any high sustained roll rates at negative, or even *low* angles of attack (the dash one says so, too).

Flight conditions were: Approximately 400 KCAS, FL 230, approx .5 G, rapid roll rates. Roll-yaw coupling was apparent by the third roll. Approximate time of "maneuver" was 6 seconds. Best guess on total number of rolls was 12 to 14, altitude loss was 3,500 feet, and airspeed decreased approximately 50 knots. All three control augmentation systems (CAS) axes dropped off during the recovery. Internal wing fuel was within 50 pounds of balanced. I had 5,000 pounds of fuel remaining and a centerline tank.

Further study of the flight manual's Flight Characteristics section convinced me I really hadn't had an "auto-roll" as defined there (it always is a result of *high* AOA) but, rather, had experienced a particularly nifty example of roll and yaw coupling due to high roll rate, high airspeed, and very low angle of attack. I learned that waiting til coupling becomes evident may well be too late.

I hope the telling of this experience may keep some other aggressively exuberant Eagle driver from being an unwitting and unwilling passenger for one devil of a ride.

Thanks to the author of this (There I Was) story. It drives straight to the heart of this program. You may well save a young, eager flying officer from a worse fate and the Air Force a multi-million dollar hunk of readiness and combat potential. Thanks again. ■

Brig Gen Leland K. Lukens
Director of Aerospace Safety

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

BACK ROW L TO R:
Maj Ricardo W. Mestre, Capt Thomas A. Wick, Maj Jerald D. Nelson, TSgt Tommy M. Thomas, CMSgt Arthur L. Kveck, SMSgt Leonard A. Crozier,

FRONT ROW L TO R:
SSgt James E. Hall, SSgt Robert L. Huntsinger, SSgt James E. Rodriguez TSgt Michell K. Ritchie, SRA Robert C. Medina.

NOT PRESENT FOR PHOTOGRAPH:
SSgt David L. Rebholtz, SSgt Pete R. Mathewson, TSgt John H. Anthony A1C Karl R. Myers.

■ On 16 January 1980 Major Mestre and crew departed Hickam Air Force Base, Hawaii, on a routine cargo/passenger mission to Andersen Air Force Base, Guam in a C-5A. The copilot, Captain Wick, was flying the airplane from takeoff through departure, which progressed normally until the landing gear retraction sequence. Just prior to the gear indicating up and locked, at about 100 feet AGL, two loud bangs were heard throughout the airplane. Immediately afterward, the number 2 engine fire light illuminated along with associated changes in engine instruments and a slight yaw. The copilot advanced all throttles, except number 2, to takeoff rated thrust and the pilot pulled number 2 engine fire handle. Major Mestre then took control of the airplane, at about 200 feet AGL, directed the copilot to discharge the primary fire bottle into number 2 engine, and called for the In-flight Engine Shutdown Checklist. Honolulu Tower reported smoke and flames coming from the left wing, as the pilot began maneuvering the airplane for an emergency recovery. A visual scan of the engine revealed the right blow-out door was missing and that flames, smoke, and sparks were coming from the engine. The pilot then directed the copilot to discharge the alternate fire bottle, and the engineer to discharge nitrogen into the left wing leading edge and number 2 pylon. The number 2 engine fire light remained

☆U.S. Government Printing Office. 1980—214/02

49th Military Airlift Wing (Associate) (AFRES)
ravis Air Force Base, California

, and fire was confirmed by visual scan. The copilot clared an emergency with the tower and completed the -flight Engine Shutdown Checklist. While on downnd to the landing runway, at about 500 feet AGL, and proximately three minutes after takeoff, the left wing ct overheat warning light illuminated. The Pylon Fire ecklist was accomplished and nitrogen was continusly applied to the wing area until egress. The number engine fire light remained illuminated and flame and oke were visually confirmed from both the airplane d ground until after landing. The pilot elected to keep flaps and slats lowered, guarding against a possible mber 1 engine involvement, which would have exded flap and slat travel time, and lowered the landing ar on turn to short final. An uneventful landing was de, and the airplane was stopped on the runway center e with 5,500 feet remaining. The pilot pulled number fire handle, called for egress of the passengers out of right side of the airplane, and sounded the warning rn. Three loadmasters moved from the flight deck, ough the cargo compartment, to the troop compartnt, to assist the two passenger loadmasters in evacung the 73 passengers, which included women, children, l infants from the airplane. The pilot and one flight gineer remained at their positions, started an APU to maintain communication with the troop compartment and tower, and shut down numbers 3 and 4 engines with the fire handles. The navigator, copilot, two flight engineers, two loadmasters, and two crew chiefs evacuated the six ACMs located on the flight deck, egressed through the crew entry door, and proceeded to the right side to assist in evacuation of the passengers. The passengers were egressed by means of two emergency egress slides, one of which would not open and had to be used as an apron chute, both held in place by eight of the crewmembers, now on the ground, and one firefighter. Six minor first-aid injuries were sustained by passengers egressing on the inflated slide. The Honolulu Fire Department, which met the airplane just after it had stopped, contained the fire to the engine and pylon area, but was unable to extinguish it until well after all the passengers and crew had been evacuated. When passenger evacuation was complete, the flight engineer and pilot egressed the airplane. The aircraft commander conducted a survey to determine that all 94 passengers and crew were accounted for. Major Mestre and his crew's superior airmanship, procedural knowledge, and exceptional crew coordination were directly responsible for the safe recovery of a valuable aircraft and all personnel on board. WELL DONE! ■

We're Changing
Starting with our NAME.

Beginning with January your old friend Aerospace Safety Magazine will become the Flying Safety Magazine

Beginning January when you think of flying safety

THINK OF THE **flying** SAFETY MAGAZINE